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SUMMARY OF RECENT ABSTRACTS*

II. YELLOW FEVER †

Virus

Isolation of yellow fever virus from the blood after the 6th day of illness is uncommon, but DOWNS *et al.* (p. 309) report a case in Trinidad in which the virus was isolated from blood taken on the 12th day. Blood taken later indicated that the immune response in this patient was very poor. ANDERSON and WATTLEY (p. 310), also in Trinidad, isolated the virus from the livers of 3 patients who died of the disease. These are apparently the first isolations from human liver tissue, though the virus has been recovered from the livers of howler monkeys.

REAGAN *et al.* (p. 175) describe the electron microscope appearances of virus 17D.

Epidemiology: Transmission

PORTERFIELD (p. 1416) has compared the haemagglutination-inhibition (HAI) test with the mouse protection test in a large number of human sera collected in the Gold Coast. He found good agreement between them in some areas, but less good in others in some of which the HAI titres increased with increasing age of the subjects. This may have been due to some agent, serologically related to the yellow fever virus, producing antibody which cross-reacts with yellow fever antigen in HAI tests. In such areas of disagreement the HAI test should be checked by protection tests.

In the islands of S. Tomé and Principe, Portuguese Guinea, CAMBOURNAC and GÂNDARA (p. 308) failed to find evidence of yellow fever infection in

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1956, v. 53. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on yellow fever in this series see the February issues of the *Tropical Diseases Bulletin* each year since 1939.

295 sera collected from children under the age of 15 years, and they therefore believe that the virus does not exist there.

Neutralizing antibodies against yellow fever have previously been found in *Cercocebus albigena johnstoni*, but it was not known if this monkey could infect susceptible mosquitoes. WILLIAMS (p. 1332) has now shown that in one animal infected in Uganda the amount of circulating virus found could have been enough to infect mosquitoes, and he concludes that the monkey could have taken part in maintaining the mosquito-monkey-mosquito cycle in nature.

The epidemiology of yellow fever was discussed at the Conference convened by the Pan American Sanitary Bureau (p. 870), and it was pointed out that in the Americas the monkey hosts of the genus *Cebus* do not commonly die from the infection, whereas *Alouatta* and *Ateles* do. The accepted vector is *Haemagogus spegazzinii falco*, but virus has not been recovered from it despite elaborate search, and it is possible that other species of *Haemagogus*, or even species of *Phlebotomus*, may be implicated. For rural populations exposed to the risk of infection by mosquitoes infected from jungle animals vaccination cannot constitute a complete protection. Outbreaks in towns tend to occur when the *Aëdes* index is high, and protection lies in eradication of *Aëdes*. Urban outbreaks are the chief potential causes of maritime transmission.

In Honduras yellow fever has recently been confirmed as a cause of death in forest monkeys, but no human cases have been recognized. TRAPIDO and GALINDO (p. 44) collected a very large number of mosquitoes from the area, but tests in mice failed to detect yellow fever virus in any. Further work is to be undertaken.

In Trinidad, where no yellow fever had been recognized since 1914, there was a sharp outbreak in 1954 in man and monkeys. DOWNS *et al.* (p. 308) show that the virus was repeatedly found in pools of *Haemagogus spegazzinii* captured at ground level. No virus was found in *Aëdes aegypti*, but epidemiological investigation suggests that 3 patients might have been infected by this mosquito. The other patients were probably infected in the forests, but as *Aëdes aegypti* is very widespread, it may have been responsible for some of these forest infections. It seems probable that this outbreak was the result of fresh introduction of the disease from South America. In a note on this recent outbreak GILLETTE (p. 1333) remarks that mosquitoes of the genus *Haemagogus* were shown to harbour the virus in the forest and that these mosquitoes occur in the wooded suburbs of Port-of-Spain. Since the beginning of the outbreak efforts have been made throughout the island to control *Aëdes aegypti*; BHC is used as a larvicide and the prospects for eradication are good. DDT proved disappointing in earlier control schemes.

In an account of the ecological conditions governing the distribution of *Haemagogus* species in Ecuador LEVI-CASTILLO (p. 739) states that dispersion of *H. spegazzinii falco* is recent and is due to the optimum conditions presented by the destruction of bamboo forests and the planting

of banana trees, leaving the bamboo stumps in which larvae readily thrive in the rainy season. He (p. 872) describes *Haemagogus soperi* n. sp. from Ecuador, which has been confused with *H. spegazzinii falco* and which he claims to be a vector of the yellow fever virus. This claim is apparently made on the ground that it is the only relevant species found in a coastal area where yellow fever occurs in monkeys and man; there is no account of experimental proof that it is a vector.

TRAPIDO and GALINDO (p. 1231) report the finding of *H. equinus* in Texas, and they comment that although it has not been conclusively shown to be a natural vector of yellow fever virus, it was the only species found in association with the outbreak in Honduras in 1954, and is known to be capable of transmitting the virus in the laboratory. KOMP (p. 176) observed oviposition by *Haemagogus equinus* on damp moss surrounding a hole in the trunk of a mango tree.

The distribution of *Aëdes aegypti* in the United States is described by BRADLEY and ATCHLEY (p. 577) who show that it is still common and widespread in the south-eastern States.

TEESDALE (p. 575) reports a study of the bionomics of *Aëdes aegypti* in its natural habitats in a coastal region of Kenya, and discusses its role as a possible vector of yellow fever. The original should be consulted for details.

Control: Immunization

PINTO SEVERO (pp. 45, 1334) gives an account of the campaign for eradication of *Aëdes aegypti* in the Americas, in which the technical assistance and coordination of the Pan American Sanitary Bureau have been cardinal features. The use of DDT simplified some aspects of the work but did not eliminate the great importance of regular and careful search for foci of breeding, or for adult mosquitoes, which indicated the progress of the campaign.

In West Africa ELLIOTT (p. 505) has been successful in preventing the breeding of *Aëdes aegypti* in water-storage pots by placing pellets of sand and cement, impregnated with dieldrin or lindane (BHC) in them. Dieldrin is more toxic than BHC to vertebrates, but is much less soluble in water, and at 26°C. it is soluble only to the extent of 0.05 part per million, which is well below the level regarded as unsafe.

In relation to the recent outbreak of yellow fever in monkeys and man in Central America ALDIGHIERI (p. 46) points out that the public health measures taken were designed to limit the cases in rural and forest populations exposed to the vector (*Haemagogus*) and to prevent secondary urban epidemics in the presence of *Aëdes aegypti*. In rural areas a campaign of immunization with 17D vaccine (subcutaneously) or Dakar vaccine (by scarification) was the only feasible measure. In the urban areas the elimination of *Aëdes aegypti* demands strict attention to detailed routine.

In WHO Monograph No. 30 (p. 872) are published a series of papers on

yellow fever immunization. The preparation and administration by scarification of the French strain are described, and the point is made that the scarification technique allows the simultaneous administration of smallpox vaccine. An account is given of the development of vaccine virus 17D, and the suggestion is made that this also may be administered by scarification, which would simplify technique and effect considerable saving of money. These vaccines lead to the development of antibodies within 7-10 days and protection can still be demonstrated in the great majority of persons tested 6-12 years after vaccination. It is suggested that vaccination of 70 per cent. of the inhabitants of rural areas exposed to jungle yellow fever offers a good margin of safety. An account is given of post-vaccination reactions; these, in varying type and degree of severity, have been noted after practically all methods of immunization, irrespective of the immunizing strain used.

MACNAMARA (p. 577) discusses yellow fever vaccines, pointing out that the 2 commonly used strains (French neurotropic strain and 17D) may be grown in mouse brain or in embryonated hen eggs, and may be administered as vaccines by scarification or subcutaneous injection. There are therefore 8 different combinations of strains, production and methods of administration, and one combination (17D grown in mouse brain and administered by scarification) is new. This is being tested.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control; Animal malaria—monkeys, other animals, birds.

WEYER, F. Bemerkungen zum Erlöschen der ostfriesischen Malaria und zur *Anopheles*-Lage in Deutschland. [Observations on the Disappearance of Malaria in East Friesland and on the *Anopheles* Situation in Germany] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, June, v. 7, No. 2, 219-28. [Numerous refs.]

The English summary appended to the paper is as follows:—

“ Malaria has ceased to be autochthonous in Western Germany since 1950 when the last certified cases were observed in Schleswig-Holstein. Also the last focus of endemic tertian malaria in Eastern Friesland seems extinct now.

“ In evaluating ecologic causes of this event it has been shown that no population shifts between *Anopheles atroparvus* and *Anopheles messeae* have occurred during the last 25 years in the coastal regions of Germany. *Atroparvus* still forms 90 per cent of populations existing in Eastern Friesland.

"Anopheles were able to multiply in the post-war period owing to favorable conditions for breeding but have rapidly decreased in number during the last years, in suburban and cultivated areas as well as in rural districts with no apparent changes of ecology. This reduction, which probably led to the extinction of malaria, cannot be satisfactorily explained."

MALAYA, FEDERATION OF: Annual Report of the Malaria Advisory Board for the Year 1955 [ANDERSON, R. E., Chairman]. 17 pp., 1 fig. [10 refs.] 1956. Kuala Lumpur: Govt. Press. [\$1.50; 3s. 6d.]

The Report contains the usual classified tables of population, malaria incidence and mortality and new planting of rubber, which show that the total admissions to Government and State hospitals for malaria in 1955 amounted to 8,577 or 38 per cent. of the figure in 1947 which is now taken as a base line. The decrease has been almost steadily progressive. In successive years admissions have amounted to 69, 66, 53, 72, 63, 57, 44 and 38 per cent. of those in 1947.

The Report is much enlivened by a critical review of the statistics of malaria from 1891 to 1955. It shows that the recorded figures represent a part only of the cases occurring but that the proportion is probably consistent. The period can be divided into 3: before 1904, from that year to 1940, and from 1947 onwards. In the first malaria incidence was high but without great fluctuation. In the second the disease was epidemic, showing great fluctuations which were related to the amount of fresh planting of rubber and the general prosperity and activity of the population. In the third period there has been a progressive decrease which appears unrelated to planting activity. Possible causes for this decrease are reviewed and the author concludes that incomparably the most potent element must have been the wide adoption of prophylactic medication both on estates and among the general population, and largely with proguanil. Other factors doubtless play their part, notably the reduction of migration and a change in the mechanism of rubber planting which does not so much favour the breeding of *Anopheles maculatus* as did the old process, but the major credit must be given to medication.

[The decline is dramatic and its causes doubtless complex. * If medication is a major cause the correlation between its application and the reduction of disease should hold in all localities. A critical review of localities with this in mind would be of special interest.]

G. Macdonald

PETERS, W. The Mosquitos of Liberia (Diptera; Culicidae), a General Survey. *Bull. Entom. Res.* 1956, Oct., v. 47, Pt. 3, 525-51, 1 fig. [36 refs.]

This is the third in a series of papers on the mosquitoes of Liberia [this *Bulletin*, 1955, v. 52, (1241)]. It is a summary of available information

and includes the results of the author's own work between April 1953 and May 1954.

The climate and topography of Liberia are described and a list is given of approximate latitudes, longitudes and altitudes of places shown on a map.

The mosquitoes of the country are listed and brief accounts are given of the distribution, bionomics and taxonomy of each species. Altogether 85 species have been recorded of which 13 are anophelines. Some points from this account refer to *Anopheles funestus* which is entirely endophilic and anthropophilic and is easy to control by house spraying with DDT and other residual insecticides. It is second only to *A. gambiae* in its importance as a malaria vector in Liberia.

A. gambiae is widespread throughout the country and there is some evidence to support Holstein's suggestion that there are 2 races, but the point is not discussed.

A. gambiae var. *melas* may be of greater importance than *A. gambiae* as a malaria vector in the vicinity of its coastal breeding sites.

A. hancocki must be regarded as a potential malaria vector of some significance during the early part of the dry season when it is at its maximum density.

Few culicines were seen in human dwellings; those captured were taken in the daytime and were more commonly found in latrines, chicken coops, tree holes and other outdoor haunts. The majority were obtained by rearing from collected larvae and pupae.

Malariological findings and the results of control operations are to be published later.

H. S. Leeson

LEWIS, D. J. **The Anopheline Mosquitos of the Sudan.** *Bull. Entom. Res.* 1956, Oct., v. 47, Pt. 3, 475-94, 16 figs. [Numerous refs.]

The distribution of 29 species and 3 varieties of *Anopheles* in the Sudan is discussed and shown on maps.

In the 10 years which have elapsed since the extermination of *A. gambiae* in the Wadi Halfa area malaria has been almost unknown there and though this anopheline sometimes reappears in the neighbourhood there has been no serious spread in or into Egypt. When the presence of larvae is reported, treatment of all pools with DDT in oil is commenced but 6 specially constructed "detection pools," which are regularly examined, are left untreated. Females of *A. gambiae* have occasionally been observed biting man in uninhabited parts of the Sudan.

A. nili may transmit malaria to some extent in the south. The status of *A. dthali* as a vector is still uncertain. *A. funestus* is an important vector as far north as Jebelein. *A. rufipes* is probably a vector in some places. *A. pharoensis* is thought to be of little importance, but it is desirable to know to what extent females rest in thatch and to watch the

growth of shrubbery near houses. Other species which have been found infected with malaria parasites in other parts of Africa have not been dissected in the Sudan.

The literature on *Wuchereria bancrofti* in the Sudan is briefly reviewed. In the Sudan *A. gambiae* is common in two infected areas (Nuba and Zande) and *A. funestus* in the south.

H. S. Leeson

LAING, A. B. G. **Proguanil Resistance—Extension to the Gametocytes of *Plasmodium falciparum*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 496–504, 8 figs. [13 refs.]

The object of the investigation here reported was to determine whether resistance to proguanil observed in the trophozoites of *Plasmodium falciparum* might also extend to the gametocytes in naturally acquired infections.

Batches of *Anopheles maculatus* were allowed to feed on 8 patients suffering from *P. falciparum* malaria, who had failed to respond when treated with 400 mgm. of proguanil daily, until gametocytes were found in blood films and for a further period until mosquitoes were available for feeding.

Positive gland infections were found in some mosquitoes of every batch fed on these 8 patients during or after proguanil therapy, indicating that the gametocytes as well as the trophozoites were resistant to the drug. In two cases trophozoites and gametocytes of *P. falciparum* proved resistant to proguanil but sensitive to pyrimethamine. This finding is of interest in view of the work of ROBERTSON *et al.* [this *Bulletin*, 1953, v. 50, 186], who showed that a proguanil-resistant strain of *P. falciparum* imported from Malaya was also resistant to pyrimethamine.

G. Covell

WALTERS, J. H. & BRUCE-CHWATT, L. J. **Sickle-Cell Anaemia and *falciparum* Malaria.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 511–14.

The writers of this letter do not agree with ALLISON's suggestion [this *Bulletin*, 1956, v. 53, 1267] that the main factor determining the frequency of the sickle-cell gene in any population is environmental, *i.e.*, mortality from *P. falciparum* malaria. In a group of Ilobi children in Nigeria under the age of 5 parasitaemia was at least as common in the sicklers as in non-sicklers except in the first year when it was slightly higher in 40 non-sicklers than in 3 sicklers. From 1 to 2 years the proportion of sicklers was 7 to 20; from 2 to 3 years 8 to 45, from 3 to 4 years 11 to 34 and from 4 to 5 years 8 to 25. This suggests that some factor or factors selectively preserve the carriers of the sickle-cell gene in the first year but cease to operate thereafter. However the writers do

not attribute this action to *P. falciparum* malaria. Their reasons are: (1) that in the first year group neither the incidence of *P. falciparum* parasitaemia nor the average intensity of infection is greatly different in the sickling and non-sickling group and (2) that a significant degree of immunity against *P. falciparum* malaria is uncommon before the third year among the particular children studied.

[It might be worth pointing out that RAPER (*ibid.*, 1955, v. 52, 736) found in Uganda no evidence of differential parasite density at different ages when he examined small groups of children but that he obtained significant results when very large numbers were tested. Allison did perhaps not make sufficiently clear in his lecture that it is this work of Raper's which represents the sole evidence for relative protection of non-immune children in Uganda.]

H. Lehmann

COUTELLIER, J. Valeur diagnostique de l'étude des leucocytes dans le paludisme aigu. [Diagnostic Value of the Study of Leucocytes in Acute Malaria] *Bull. Soc. Path. Exot.* 1956, Mar.-Apr., v. 49, No. 2, 265-9, 1 graph.

In highly malarious regions it is often difficult to diagnose malaria for certain in patients suffering from fever; the presence of parasites in the blood does not necessarily indicate that they are the cause of the symptoms, while their absence, even in a thick film, may be due to the fact that the patient has been taking an antimalarial drug. The leucocyte count helps in these circumstances.

Two groups of patients in the Belgian Congo were compared. The first group included children and adults suffering from acute malignant tertian malaria with a heavy parasitaemia and were treated with chloroquine; the second group included only adults in hospital for non-infectious conditions but also treated with chloroquine, as a control. The control group showed an average count of 3,200 polymorphonuclears, 2,000 lymphocytes, 1,600 eosinophils and 500 mononuclears per cmm. of blood, and these figures were uninfluenced by the administration of the drug. In children with acute malaria the polymorphonuclears were augmented at the beginning of the attack and then fell below normal, the eosinophils were at first diminished or absent, returning to normal with treatment, and lymphocytes showed a general increase throughout the attack. In the adults with acute malaria there was no initial polymorphonuclear leucocytosis, the eosinopenia resembled that occurring in children, while the lymphocyte count was unchanged at first, but rose slightly during the course of treatment. Plasma cells were found in 30 per cent. of these adults.

These figures are of most importance in the diagnosis of fever in children: it is clear that an early polymorphonuclear leucocytosis does not

contraindicate a diagnosis of malaria, though if this persists with treatment, malaria is unlikely to be the cause of the symptoms.

P. C. C. Garnham

COOK, J. E., BRIGGS, G. W. & HORNS, H. L. **Acute Acquired Hemolytic Anemia due to Delayed Primary Attack of Vivax Malaria.** *Ann. Intern. Med.* 1956, July, v. 45, No. 1, 139-42. [13 refs.]

The patient left Korea in September 1953 and was given a course of primaquine 15 mgm. daily for 14 days and chloroquine 0.9 gm. on one day and 0.3 gm. daily for 2 days. In April 1954 he was treated with anticoagulants for thrombophlebitis of the right leg. In July 1954 he was admitted with a history of chills, fever and sweating. On the day of admission he noticed his urine was dark. Examination revealed enlarged liver and spleen, red cell count 2.6 million cells per cmm., haemoglobin 9.0 gm. per cent., haematocrit 27. Blood cells showed moderate anisocytosis, with 8 per cent. reticulocytosis. Plasma protein was normal. Tests for blood in the stools were negative. Faecal urobilinogen was raised and there was urobilinogen in the urine. Bone-marrow was normal. Haemosiderin test on urine was normal. The Hams test for nocturnal haemoglobinuria and the Donath-Landsteiner test were normal.

From admission, blood films were examined daily for malaria parasites. The "first positive *Plasmodium vivax* malaria smear" was obtained on September 7th. The patient was given primaquine and chloroquine in the same doses as before and was asymptomatic with normal erythrocyte count by November.

During the period of observation before the discovery of *P. vivax* (whether asexual forms or gametocytes is not stated) there was evidence of active haemolysis evinced by anaemia, elevated reticulocyte count, nucleated red cells and raised faecal urobilinogen.

[If erythrocytic forms of *P. vivax* were in fact found in this case, it must be presumed either that the original combined treatment was unsuccessful or that there had been subsequent reinfection. The clinical picture suggests to the abstracter the effects of a long-continued *P. vivax* infection rather than those of an acute delayed primary attack. The description "acute acquired hemolytic anemia" is not altogether justified.]

B. G. Maegraith

NIETO-CAICEDO, M. **Hydroxychloroquine in the Treatment of Malaria.** *Amer. J. Trop. Med. & Hyg.* 1956, July, v. 5, No. 4, 681-5. [10 refs.]

Hydroxychloroquine [Plaquenil, this *Bulletin*, 1955, v. 52, 746] sulphate was administered orally to 50 patients in Venezuela infected with *P. vivax*. The dosage schedule was as follows:—

Dosage of hydroxychloroquine

Age	Dosage	Method
Under 1 year	1 tablet (150 mgm. base)	Single dose
1 to 2	2 tablets (300 mgm. base)	One tablet plus one 8 hours later
2 to 5	3 tablets (450 mgm. base)	Two tablets " " " " "
6 to 10	4 tablets (600 mgm. base)	Two " " two " " "
11 to 15	4 tablets (600 mgm. base)	Single dose
Adults	5 tablets (750 mgm. base)	Single dose

Blood smears were examined until they became negative. Temperature and symptoms were recorded.

Side effects were negligible except in a few patients who had transient nausea or vomiting. There were no ill effects in 5 women, 2 of whom were pregnant and 3 breast feeding at the time of treatment.

Parasitaemia and fever were controlled in averages of 1.8 and 1.3 days respectively.

B. G. Maegraith

KRAAN, H. De maliabestrijding in Noord-Holland gedurende en na de epidemie van 1946-1948. [Malaria Control in a Dutch Province] *Nederl. Tijdschr. v. Geneesk.* 1956, Aug. 25, v. 100 (iii), No. 34, 2440-45, 1 chart. English summary (3 lines).

In recent years mass examination of schoolchildren has been practised in Holland as a means of detecting foci of malaria. Whenever enlargement of the spleen was found the child's family was investigated, and the house was sprayed with DDT to eliminate mosquitoes. In one year as many as 19 per cent. of the houses in a single town had to be sprayed, but the number decreased steadily in subsequent years. In 3 communities in which all the houses were sprayed the number of cases of malaria fell from 76, 250 and 94 in 1947 to 9, 26 and 33 in 1948, and no case occurred in 1949. The cost of spraying was high, amounting to 10 florins per inhabitant with full spraying, or 0.47 florin with partial spraying.

D. J. Bauer

MARIANI, M. Sulla sensibilità dell'*A. labranchiae* al DDT dopo sette anni di lotta antianofelica con insetticidi clorurati in Sicilia. [Susceptibility of *Anopheles maculipennis labranchiae* to DDT after 7 Years of Insecticidal Control] *Riv. di Parassit.* Rome. 1956, July, v. 17, No. 3, 171-7, 2 graphs. [11 refs.]

The English summary appended to the paper is as follows:—

"The author reports the research carried out together with Sicilian malariologists on the susceptibility of *A. labranchiae* to DDT. Having described the techniques employed and having reported his results, the

author concludes that up to date the susceptibility to DDT of *A. labranchiae*, of *Myzomyia superpictus* and of *A. claviger* has undergone no change since 1945 notwithstanding eight years of systematic indoor use of DDT. The author brings forth the hypothesis that this unchanged susceptibility might be especially due to the fact that larval breeding places were left untreated and that chlorinated hydrocarbons were sparsely employed in agriculture."

NIGERIA, NORTHERN: Malaria Control Pilot Project in Western Sokoto.

Second Annual Report 1955-1956 [BRUCE-CHWATT, L. J. & HAWORTH, J.]. 48 mimeographed pp., 3 maps & 6 charts. 1956. **With an appendix on Investigations on the Chemistry of Insecticides** by D. M. LANGBRIDGE. 19 mimeographed pp., 4 figs.

The Sokoto scheme is a pilot malaria control project covering an area of 600 square miles in Northern Nigeria. After elaborate preliminary surveys control was started in mid-1954 and there are now 4 zones in which the insecticides used are DDT at 2 gm. per m.², dieldrin at 0.25 gm. per m.², dieldrin at 0.50 gm. per m.², and BHC at 0.25 gm. per m.². Each of these is applied on a 6-month cycle.

The story is here recounted for the last three-quarters of 1955 and the first of 1956, with considerable tabular matter on staff, transport, spraying operations, meteorological data, malariometry, entomology and resistance to insecticides. The report has an attached appendix by Langbridge on an investigation on the chemistry of insecticides. Much of the report is inevitably dominated by the fact that *Anopheles gambiae*, the most important vector, was found to survive the application of dieldrin in mid-1955, and in September of that year it was confirmed by ELLIOTT and RAMAKRISHNA [this *Bulletin*, 1956, v. 53, 857] to have an enhanced resistance to that insecticide. Studies of this resistance are being continued in the field and elsewhere [see below]. The report was written at a time when these studies were very young, but it supplies an invaluable background to them in the form of detailed information on the changes in anopheline density and infectivity, and in the prevalence of malaria among different groups of the population first after the initial successful control and later following the development of anopheline resistance. The reversal of the original marked downward trend of both anophelines and malaria, recorded in detail, is most striking in the 2 dieldrin zones but also occurs in the BHC zone. The reduction was more satisfactorily maintained in the DDT zone though the author comments that in 2 places there was an unwelcome rise, and the possibility of an increase in tolerance of the mosquito needs exploration.

In the appendix Langbridge deals with the technique and results of examination of insecticides delivered to the scheme, recording the findings particularly in one unsatisfactory consignment and the means by which its

susceptibility was later increased. He also records the method used in sampling deposits of insecticide on walls, giving a full account of the methods used in estimation of DDT, BHC and dieldrin. For the last two he used a modified semi-micro Stepanow technique. Examinations were made of the superficial half millimetre; there was a loss of between 40 and 60 per cent. of each of them during the first 2 weeks; the rate of loss of DDT and dieldrin thereafter declined, second and subsequent applications of these 2 insecticides disappeared at a slower rate, presumably owing to partial saturation of the wall, though later applications of BHC showed no enhancement of residual life in comparison with the first.

G. Macdonald

DAVIDSON, G. **Insecticide Resistance in *Anopheles gambiae* Giles.**
[Correspondence.] *Nature*. 1956, Sept. 29, v. 178, 705-6.

It has been reported [ELLIOTT and RAMAKRISHNA, this *Bulletin*, 1956, v. 53, 857] that a dieldrin-resistant strain of *Anopheles gambiae* has arisen in Northern Nigeria. The author describes tests made at the Ross Institute, London, for cross-resistance to the related chlorinated hydrocarbon insecticides, aldrin, alphachlordane, betachlordane, isodrin, endrin and gamma BHC.

Female mosquitoes were exposed for suitable periods to filter paper treated with various concentrations of the insecticides. Mortality counts were made 24 hours later. The susceptibilities of the resistant strain have been compared with those of a susceptible strain of *A. gambiae* from Lagos.

The results show that while the resistant strain is susceptible to DDT, pyrethrins and malathion, it is very resistant to dieldrin and its related compounds, the degrees of resistance being in the order alphachlordane (highest), betachlordane, dieldrin, aldrin, isodrin, endrin, and gamma BHC (lowest). With dieldrin-resistant house-flies BUSVINE [*ibid.*, 857] reports the order alphachlordane (highest), betachlordane, aldrin, dieldrin, gamma BHC, isodrin and endrin (lowest).

W. Z. Coker

DAVIDSON, G. **Insecticide Resistance in *Anopheles gambiae* Giles: a Case of Simple Mendelian Inheritance.** [Correspondence.] *Nature*. 1956, Oct. 20, v. 178, 863-4.

From tests on the susceptibility of crosses and back-crosses of 2 Nigerian strains of *Anopheles gambiae*, one highly resistant to dieldrin with associated resistance to chlordane, aldrin, isodrin, endrin and gamma BHC and the other normally susceptible to these insecticides, it is concluded that inheritance of this resistance is monofactorial with incomplete dominance. These tests have been made with dieldrin and gamma BHC only. Median lethal concentrations (as percentages in Risella oil) for

each insecticide against both parent strains and the hybrids are given in this table, the time of exposure being 1 hour.

	Susceptible strain (S)		Resistant strain (R)		Hybrid R Female \times S Male		Hybrid R Male \times S Female	
	Female		Male		Female		Male	
	Dieldrin	0.08	0.05	>4.0	>4.0	2.6	1.5	2.3
Gamma BHC		0.007	0.006		0.21	0.18	0.053	0.038
							0.052	0.038

A 1-hour exposure with dieldrin fails to kill the resistant strain even when Risella oil is saturated with dieldrin (a 4 per cent. solution), and the LD50 is therefore shown simply as greater than 4.0 per cent. in the table. Increased time of exposure has, however, shown the resistant strain to be 800 times as resistant to dieldrin, and 26 times as resistant to gamma BHC, as the normally susceptible strain from Lagos. The hybrids are 30 and 7 times resistant to, respectively, dieldrin and gamma BHC. In terms of 1-hour exposures, dosages of 0.33 per cent. dieldrin and 0.025 per cent. gamma BHC will kill only mosquitoes of the susceptible strain while doses of 4.0 per cent. dieldrin and 0.1 per cent. gamma BHC will allow only mosquitoes of the resistant strain to survive. It is pointed out that the LD50 for an insecticide tested in the laboratory against a wild population of insects could be greatly influenced by the proportion of highly resistant, susceptible, and hybrid individuals present. This seems to have been the case for *A. gambiae* in Western Sokoto, Nigeria, which was, in 1955, recorded as only 8 times more resistant than normal [this *Bulletin*, 1956, v. 53, 857].

There seems need, in view of this phenomenon of monofactorial inheritance of resistance, for a new approach to testing for resistance in wild populations of mosquitoes suspected of resistance. This is so in order to establish whether or not it is composed of 3 discrete groups of individuals, *viz.*, normally susceptible, highly resistant, and their hybrids. This could be done by testing the suspect population at the lowest dosage giving 100 per cent. mortality (minimum LD100) in a known susceptible strain. Survivors would be presumed to be of the resistant group and of hybrids of these with the susceptible mosquitoes. Their progeny could then be tested at higher dosages to eliminate the hybrids and give an indication of the resistance level of the pure resistant group. Alternatively, a population suspected of resistance could be tested against a large series of graded dosages of an insecticide. If the dosage-mortality curve revealed 2 steps at which increasing dosage was not accompanied by increased mortality, the first step would represent the dosage level effective against susceptibles only, the second step at a higher dosage being the level at which both susceptibles and hybrids were killed but not individuals of the resistant group.

The above strain of *A. gambiae* so highly resistant to dieldrin and with cross-resistance to other chlorinated hydrocarbons is still, it should be noted, susceptible to DDT.

D. S. Bertram

RAJAGOPALAN, N., VEDAMANIKKAM, J. C. & RAMOO, H. **A Preliminary Note on the Development of resistance to DDT by Larvae of *Anopheles stephensi* Type in Erode Urban, South India.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1956, July, v. 4, No. 4, 126-8.

From 1947 to 1955, as an antimalarial measure in Erode Town, South India, wells had been treated weekly with 0.5 per cent. DDT-kerosene-soap emulsion at the rate of one ounce per well. Residual spraying was commenced in June 1955.

In December 1955 it was observed that the larvae of *Anopheles stephensi* had grown tolerant to DDT. Laboratory tests for resistance to DDT were made. In these preliminary tests a few larvae from the DDT-treated wards of the town and from an untreated area (Veerappanchathram) have been exposed to 7-9 mgm. of DDT per square foot of water surface.

The results show that after a 24-hour exposure only 43 per cent. of the Erode Town strain larvae were killed whereas larvae of the strain from the untreated area were all killed, over 99 per cent. of the latter being killed within the first hour. The authors conclude that resistance to DDT has developed to some extent in the *A. stephensi* larvae in Erode Town. Imagicidal tests are being undertaken. *W. Z. Coker*

RAHMAN, J., SINGH, M. V. & PAKRASI, M. **Malaria Control in the Colonisation Scheme, Kashipur, District Naini Tal, U.P. (1949-1954).** *Indian J. Malariaiology.* 1956, June, v. 10, No. 2, 155-63, 1 map.

This paper adds to the literature on the control of malaria in the previously hyperendemic foothill area of the Himalayas known as the Terai, in which a great expansion of population took place immediately after the partition of India and Pakistan. In the area described the population grew rapidly from 2,108 to 9,800.

Control was practised by the use of DDT applied at 50 mgm. per square foot, originally once every 6 weeks but on a 3-month programme from 1950 onwards. There was a general distribution of proguanil, 300 mgm. weekly, which was reduced in 1950 to medication of selected groups and abandoned in 1954. The parasite rate dropped from 8.5 to 0.32 per cent. between 1949 and 1950 and has subsequently increased to 1.7 per cent. in 1954. The spleen rate has decreased from 59.8 to 3.07 per cent., and the percentage of malaria cases among those attending for treatment has decreased from a monthly average of 19.1 per cent. in the last 7 months of 1949 to 17.2 per cent. in the same months of 1954. A list is given of the anophelines found in the area, among which *Anopheles culicifacies* and *A. fluviatilis* are presumed to be the carriers. *G. Macdonald*

REID, J. A. & WHARTON, R. H. Trials of Residual Insecticides in Window-Trap Huts against Malayan Mosquitos. *Bull. Entom. Res.* 1956, Oct., v. 47, Pt. 3, 433-68, 5 figs. [37 refs.]

Between 1949 and 1953 DDT, gamma BHC and dieldrin were tested against wild populations of Malayan mosquitoes, in artificial huts fitted with exit window-traps. The structure and operation of the huts are recapitulated from an earlier paper [this *Bulletin*, 1951, v. 48, 1077]. *Anopheles maculatus*, *A. sundaeicus* and *Culex pipiens fatigans* which entered in greatest numbers are the basis of the report and discussion presented in this paper, although tables and the text take account of other less frequent species. These include 3 other anopheline species and species of *Culex*, *Mansonioides* and *Aedes*.

C. p. fatigans was the only one of the species habitually resting indoors by day, the others entering to feed at night but resting out-of-doors; the anophelines probably seldom touched the walls before biting. Dosages of insecticides per square foot were 200 mgm. of DDT and 40 mgm. for gamma BHC and for dieldrin, except in certain experiments on lighter deposits in which the dosages were 100 mgm. and 10 mgm. The results are given in terms of effects on mosquito behaviour as well as on kill of mosquitoes. In principle, experiments consisted of single applications of an insecticide and a follow-up of mosquito activity and kill for up to 7 months afterwards to determine for Malayan mosquitoes and conditions which of the insecticides was most promising for mosquito and disease control and the probable effective dosage and frequency of application. Reasons are given to justify the use of artificial huts rather than occupied village huts. Except for *C. p. fatigans*, the fundamental fact for Malaya is that the species of mosquito to be controlled do not rest indoors. Eradication of species only by residual spraying indoors seems unattainable, since only a part of the total population enters huts to feed on man and contact with the walls is brief. The killing power of an insecticide should, therefore, prevent survival of mosquitoes to the age when they have become infective. In discussion, reasons are given for taking a 50 per cent. kill within 24 hours of contact with the insecticide as evidence of an acceptably efficient insecticide action.

The authors note that much of their work confirms the way in which these 3 insecticides affect mosquitoes, and also confirms their relative effectiveness as reported in recent years by numerous other workers elsewhere and in previous publications of their own in the earlier phases of this field investigation. The present paper does stress, however, the importance as observed in Malaya of innate physiological differences between species in their susceptibility to insecticides. *A. maculatus* and *A. umbrosus* are highly susceptible, and at the other extreme *C. p. fatigans* and *Aedes albopictus* are only slightly susceptible. *A. sundaeicus*, *A. letifer*, *A. barbirostris*, *Mansonia* [*Taeniorhynchus*] spp. and *Aedes butleri* are intermediate and grouped as moderately susceptible species. This

tentative classification of susceptibility is based on the results at the higher dosages used. The criteria are that there is not less than a 50 per cent. kill with susceptible species in 24 hours for 5-6 months after spraying, while this level of kill is attained for only 1-4 months with moderately susceptible species. In the case of slightly susceptible species, DDT never gives a 50 per cent. kill in 24 hours and only for 1-2 months with gamma BHC and dieldrin. The conclusion is reached that even the higher dosages tested in the present work, unless repeated with uneconomic frequency, are not likely to be effective in controlling disease vectors other than *A. maculatus*. This is, for this species, a satisfactory conclusion but the moderately susceptible species include important vectors of malaria (*A. sundiacus*, *A. barbirostris* and *A. letifer*), and of *W. malayi* filariasis (*A. barbirostris* and *Mansonia* spp.). *C. p. fatigans* which is particularly insusceptible, is potentially a vector of bancroftian filariasis and, in any case, a common biting and domestic culicine. A recent result indicates that deposits of 100 mgm. per square foot of dieldrin may be nearer the desired dosage of this insecticide which, non-irritant and long lasting, appears particularly promising for Malayan problems in mosquito control. At this dosage, it remained effective for 6 months against *Mansonia*, representative of the moderately susceptible group of Malayan mosquito species.

These carefully conducted field experiments extending over about 4 years confirmed, as others reported elsewhere, a lower rate of entry sometimes into treated huts at first. Airborne particles of insecticide affecting mosquitoes sitting outside the entry-louvers are believed to be the cause. In general, the number of mosquitoes succeeding in engorging fell sharply after treatment, but this was particularly marked for *C. p. fatigans*. An irritant action resulting in increased catches after spraying in the exit window-traps was determined for DDT and for gamma BHC. Increased catches in the traps after spraying with dieldrin are not a result of an irritant effect but due to a reaction of the mosquitoes at the onset of fatal symptoms. DDT continued to affect behaviour by its irritant action long after it had ceased to kill (in 24 hours) but dieldrin, on the contrary, continued to kill slowly after behaviour within the observational limits of the experiments appeared to be normal. The comparative action of the 3 insecticides is summarized by the authors as follows:

" . . . DDT is irritant and persistent, but not toxic enough except to the most susceptible of the species tested. BHC is irritant when fresh, though it kills at the same time; it is very toxic to all species, but does not remain effective long enough except against the most susceptible ones. Dieldrin is slower acting than DDT and BHC, but is non-irritant, very toxic and remains effective longer; against less susceptible species higher doses than 40 mg. per sq. ft. will be needed. In countries where vector species rest indoors by day, dieldrin may prove particularly lasting because mosquitos will rest on treated surfaces for long periods."

D. S. Bertram

EJERCITO, A. Malaria Eradication in the Philippines. *J. Philippine Med. Ass.* 1956, July, v. 32, No. 7, 396-411, 1 diagram. [15 refs.]

The highlights of the 6-year programme of malaria control in the Philippines [this *Bulletin*, 1955, v. 52, 513] are reviewed in relation to the change of objective from control of malaria to its total eradication. The previously planned spraying campaign, which included total coverage of all houses in the island during 3 years in a campaign extending in one area or another to 6 years, is to be extended to give total coverage in 4 years and continuation of work over 7 or 8. A surveillance mechanism is to be built on the spraying programme following the now accepted lines of intensive search for residual foci.

The problems to be encountered are reviewed and are many, so that considerable flexibility of operation must be maintained and no precise forecast of the date of eradication should be made. The problems include geographical difficulties (the Philippines consist of 2,773 named islands), objections to spraying by house-holders or to acceptance of fully effective treatment by patients, the rapid development of the country by the formation of agricultural settlement, mining and lumbering industries, and development of road and other engineering projects, and difficulties attributable to the still rudimentary administration of some remote parts inhabited by primitive or lawless people. Considerable administrative expansion, public education and determination in approach will be needed to overcome these and the programme is being re-organized in this light.

G. Macdonald

**TRINIDAD GOVT. Annual Report of the Malaria Division, Health Dept.,
Trinidad & Tobago. 1955.** 66 mimeographed pp., 16 graphs (3 coloured) & numerous pp. of tables. [1956.]

A full statement is given of all the activities of the Malaria Division during 1955 including extensive tables, covering many pages, of adult and larval mosquito catches in different sites. The residual house-spraying programme is reviewed in the same detail, practically all houses in the Colony except those in San Fernando and Port of Spain being sprayed during this year. The eradication project in Tobago continues; of 2,750 children examined only 3 were found to have enlarged spleens, and no positive blood films were found despite examination of about 3,000 films. The history of the yellow fever outbreak is recounted and the anti-*Aedes* campaign reviewed with particular reference to the discovery during it that the larva was resistant to DDT, in which connexion protocols of a large number of experiments are given in which larvae were exposed to different concentrations of the insecticide.

[The report is very full and reflects much enterprising and valuable work in several fields. The abstracter would, however, appreciate some further condensation and statement of conclusions based on the work

recounted, which might make reproduction of some of the tables unnecessary.]

G. Macdonald

FLOCH, H. La lutte antipaludique en Guyane Française. La septième campagne de "dedetisation". [Malaria Control in French Guiana. Seventh DDT Campaign] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 369.* 1955, Aug., 75 pp., 3 figs. [20 refs.]

The virtual eradication of malaria from French Guiana by 1953, the re-introduction of the disease from the Antilles [this *Bulletin*, 1956, v. 53, 542] and the subsequent action at the Fourteenth Pan-American Sanitary Conference are reviewed in full detail with many tables. The outbreak among immigrants and those in their neighbourhood was brought to an end by the suppressive treatment of immigrants with camoquin (3 doses each of 200 mgm. once weekly for 6 weeks) supplemented by 20 mgm. of Rodopréquine, a mixture of two 8-aminoquinolines [this *Bulletin*, 1940, v. 37, 457]. The economy of the country depends noticeably on immigrant labourers who work in the sugar fields and are about 3,000 in number. They come from several places but notably from St. Lucia in the Antilles where the general parasite rate is said to be 7.5 per cent. The real remedy lies in the eradication of malaria from these territories but until this is achieved the enforced treatment of immigrants from a malarious area entering the zone of eradication is considered justifiable.

The report includes some material on happenings at the Pan-American Sanitary Conference, an evaluation of human life in financial terms and a statement on the campaign against yellow fever. *Aëdes aegypti* has been eradicated from French Guiana but other sources of possible infection exist in the Caribbean and danger was considered to be acute at the time of the recent outbreak of yellow fever in Trinidad, when universal vaccination of the population in French Guiana was practised. G. Macdonald

JASWANT SINGH, RAY, A. P. & NAIR, C. P. Studies on Nuri Strain of *P. knowlesi*. Part XI. Comparative Studies on Quinine and Chloroquine administered Intravenously. *Indian J. Malariaology.* 1956, June, v. 10, No. 2, 85-93. [12 refs.]

The therapeutic effect of intravenous quinine and chloroquine in single doses was tested on 201 rhesus monkeys infected with the Nuri strain of *Plasmodium knowlesi* at different stages of the disease. At a dosage of 5 mgm. per kgm. resochin cleared the blood of parasites in moderate parasitaemias (below 40 per cent.) though recrudescences followed. Animals with heavy infections (40 to 59 per cent.) sometimes responded to such a dosage, but at higher degrees of parasitaemia invariably died. In mild infections, resochin (the diphosphate salt of chloroquine) was more

effective than nivaquine (the sulphate); quinine was useless in dosage schedules up to 34 mgm. per kgm. The life of an animal with a parasitaemia of over 40 per cent. can be saved only if blood transfusion is combined with chemotherapy.

P. C. C. Garnham

NAIR, C. P. & MENON, M. K. **Studies on Nuri Strain of *P. knowlesi*.**

Part XII. Bleeding and Coagulation Time and Thrombocyte Count in Trophozoite-Induced Infection. *Indian J. Malariology.* 1956, June, v. 10, No. 2, 95-9. [21 refs.]

A series of 43 rhesus monkeys were infected with the Nuri strain of *Plasmodium knowlesi*. The bleeding time was determined by Duke's method, before infection, during the prepatent period and daily throughout the course of the disease; before infection it was 48 seconds and ultimately dropped to 31 seconds on the day of death. The coagulation time was determined by a modification of Lee and White's method; before inoculation it was 235 seconds, and it dropped later to between 156 and 180 seconds. The normal platelet count was found to be 93,600 per cmm. of blood; it remained much the same after infection. P. C. C. Garnham

JASWANT SINGH, BASU, P. C., RAY, A. P. & NAIR, C. P. **Studies on Nuri Strain of *P. knowlesi*.** **Part XIII. Blood Sugar in Monkeys (*M. mulatta mulatta*) with *P. knowlesi* (Nuri Strain) Infection.** *Indian J. Malariology.* 1956, June, v. 10, No. 2, 101-13, 8 charts. [16 refs.]

In ordinary attacks of human malaria the concentration of sugar in the blood is little affected; in monkeys infected with *Plasmodium knowlesi* (Nuri strain) there is again little change in the blood sugar levels until parasitaemia reaches a high density.

Estimations were made by the Folin and Wu technique on oxalated blood of normal and infected rhesus monkeys fed on a mixed diet of 800 calories. The normal readings in fasting animals were found to lie between 65 and 109 mgm. per cent. and differed little from those taken at 4-hour intervals; even intravenous inoculation of glucose (0.5 gm. per kgm.) had little effect beyond a maintenance of high levels for 3 hours. During the first 4 days of parasitaemia the blood sugar level differed little from that of uninfected animals, but between the fifth and sixth days a precipitous fall to as low as 13 mgm. per cent. occurred, the actual figure being inversely proportional to the density of parasitaemia (which reaches 90 per cent. or over). The monkeys ate much less food during the terminal stages, but food deficiency could not have been the sole cause of the drop in the blood sugar, because this occurred also in animals receiving intravenous injections of glucose. One monkey showed

a meteoric fall in the sugar level to 5 mgm. per cent. in spite of glucose administration. Hypoglycaemia in the terminal stages is thought to be mainly due to the extensive centrilobular necrosis of the liver, though demand on blood sugar by the parasites could be a contributory factor.

P. C. C. Garnham

RAMA RAO, R. & SIRSI, M. Avian Malaria and B. Complex Vitamins.

1. Thiamine. *J. Indian Inst. Sci.* 1956, Apr., v. 38, No. 2, 108-14
(Sect. A), 1 fig. [10 refs.]

The thiamine level in the blood of chicks 3 to 4 weeks old, infected with 16 million *Plasmodium gallinaceum* by intramuscular inoculation, was determined (a) before infection, (b) on the fifth day of the prepatent period and (c) during infection. It was often halved by the fifth day and dropped by 60 per cent. in chicks in the parasitized condition.

Five-day-old chicks were placed on a thiamine-free diet for 10 days; they were then infected with 16 million *Plasmodium gallinaceum*. One batch was left as a control, and others were injected daily with 30 μ gm., 80 μ gm. and 160 μ gm. (per 100 gm. body weight) of thiamine for 4 days. Complete depletion of the vitamin inhibited multiplication of the parasite; partial depletion (60 μ gm. per day) caused a lowered parasitaemia and prolonged survival of the chick. High dosages (160 μ gm. or more per day) on the other hand gave rise to heightened parasitaemia and quicker mortality. Thiamine is important in the metabolism of carbohydrates in *P. gallinaceum* and when present in sufficient quantity enables the parasite to multiply rapidly.

P. C. C. Garnham

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—human, animal; American—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

WEST AFRICAN INSTITUTE FOR TRYPANOSOMIASIS RESEARCH. **Annual Report 1955** [NASH, T. A. M., Director]. 46 pp. 1956. Kaduna, Northern Nigeria.

The volume of work during the year under review has fallen owing to staff shortage. Among many interesting pieces of work may be mentioned the following.

The high rate of red cell sedimentation in sleeping sickness is due to

changes in the plasma—a great increase in gamma globulin—and not to changes in the red cells. There is an abnormal gamma globulin component in the serum, which also is found in kala azar, various forms of liver disease, and probably in certain connective tissue disorders such as rheumatoid arthritis. Liver function tests, although some of them indicate abnormalities in the liver function of sleeping sickness patients, have not conformed to the expected pattern of correlation. The evidence so far does suggest that there is liver involvement in human trypanosomiasis; this study is being continued in experimental animals.

The numbers of trypanosomes in various organs of infected rats have been computed by grinding up organs and counting the ratio of parasites to red cells. The consistently high figures for the lungs are striking; less consistently high figures were obtained for the brain and heart muscle; all these are well oxygenated organs. Degenerating trypanosomes are found in the spleen, the liver and lungs; the reticulo-endothelial system seems primarily to be responsible for their destruction. MRC wedge photometric readings of the sulphosalicylic acid method of determining the cerebrospinal fluid protein content were more accurate than the Sicard Cantaloube trichloracetic method. Standardization of the tube dimensions for the latter method resulted in greater accuracy of this test. The photometer proves well suited to field work, and its use is now being extended to a variety of biochemical estimations.

The results of treatment of sleeping sickness with Melarsen are still good after 2 years; there have been no relapses of the cases treated early. For field use the individual dose of Melarsen should not exceed 20 mgm./kgm.; major toxicity is evident in only 1 per cent. of persons given this dose. With single injections of 3 to 4 times this dose severe toxicity increases fivefold. The length of the course of treatment bears little relation to toxic effect. Melarsen is outstanding in its action on cases relapsing after treatment with the usual routine drugs; 50 per cent. of these appear to be restored to normality by it, though the cerebrospinal fluid is slow in returning to normal.

Strains in animals of *Trypanosoma rhodesiense* resistant to Melarsen, to stilbamidine and to Butarsen respectively have been re-examined, and their cross-resistance has been studied. A Melarsen-resistant strain, it is known, shows cross-resistance to pentamidine. Electrophoretic studies are in progress to determine if this and similar cross-resistance phenomena can be analysed on an ionization basis. The differences in response to drugs found to develop in strains of trypanosomes maintained on the one hand by syringe transmission, and on the other by fly transmission, are also under examination.

A rat-adapted strain of *T. vivax* has been maintained for 4 years in 589 syringe sub-passages. At the 516th sub-passage it failed by syringe inoculation to infect a sheep, and in rats it now produces a very low parasitaemia or it may fail to infect. Nevertheless, up to the 459th rat passage it could regularly be transmitted cyclically to sheep through

Glossina palpalis; at 533rd and 536th sub-passages it failed to infect cyclically. It now seems that after 4 years it has lost its ability to infect *G. palpalis*. Incidentally, it has never been possible to infect a rat cyclically from a fly infected from another rat.

The factors governing the susceptibility of *G. palpalis* to infection with *T. vivax* have been investigated. Flies from pupae kept at 23°C. fail to become infected; 30°C. was too high for successful infection; the optimum temperature for pupae is 28°C. and for flies 23°C., and under these conditions the developmental cycle of the trypanosomes is 12-13 days or less. Big amounts (90 to 150 ml.) of blood from lambs on which *G. palpalis* infected with *T. vivax* had fed 24 hours earlier failed to infect clean sheep; blood taken after 48 and 72 hours infected. Subcutaneous tissue taken at 48 hours was infective; it was non-infective at 72 hours.

Attempts to maintain *T. vivax* in culture were unsuccessful. The source of the differences in the immunological reactions of N'Dama and Zebu cattle to trypanosomal challenge has been investigated; there is little difference in the serum protein pattern of either breed when uninfected. In the infected animals an additional component is evident in the N'Dama only; in the Zebu there is considerable increase in the faster moving component of the gamma globulin.

Suramin is known to inhibit many of the pharmacological and toxic effects of pentamidine, primarily by the formation of an inactive salt complex [this *Bulletin*, 1952, v. 49, 126]. Suramin reduces the toxicity of pentamidine to man. It is here shown that suramin *in vitro* forms precipitates with ethidium and dimidium bromides, and with other strongly basic compounds used in animal trypanosomiasis. A suramin complex of ethidium, dimidium, antrycide, "528," and berenil has been found greatly to reduce the toxicity of these compounds; moreover, the admixture of suramin with ethidium gives extra prophylactic potency to the drug. Antrycide methyl sulphate and berenil, in the form of suramin complexes, do not suffer gross loss of therapeutic activity, but much larger doses of the drugs can be given in this form owing to diminution in their toxicities. The dosage and prophylactic value of various suramin complexes against *T. vivax* in cattle are at present being worked out in greater detail.

The report closes with an account of researches on the insect vectors of trypanosomiasis, and their control. The latter includes the new obstructive clearing method initiated in 1954, which shows considerable promise. A guide to the identification of West African species of the *fusca* group of tsetse is in preparation. The known range of this group has been extended by identifications throughout the forests of the Cameroons. Various studies are in progress on laboratory-reared colonies of *G. palpalis*.

The whole report presents some fascinating aspects of the problems of trypanosomiasis of animals and of stock, and of the present trend in methods directed towards their solution. It certainly should be consulted in the original by those working on the subject. *A. R. D. Adams*

VAN DEN BERGHE, L. Aspect particulier de la trypanosomiase, maladie des pêcheurs, au lac Tumba (Congo belge). [The Form of Trypanosomiasis seen in Fishermen at Lake Tumba, Belgian Congo] *Ann. Soc. Belge de Méd. Trop.* 1956, Apr. 30, v. 36, No. 2, 185-9.

The author describes the trypanosomiasis situation in the Lake Tumba region which lies some 140 kilometres (about 85 miles) south of Coquilhatville, in the Belgian Congo. This area has a history of epidemics which "literally decimated" the population between 1900 and 1916, and though the author suggests that poliomyelitis may have been involved, he also considers that the possibility of epidemic sleeping sickness cannot be completely ruled out. The population is primarily engaged in fishing and is a well-nourished one.

Two species of tsetse are involved—*Glossina tabaniformis* and *G. fuscipes fuscipes* [*G. palpalis fuscipes*]. The first is described as occurring at the edge of the forests (the characteristic trees of which are listed), near surface water and along the shores of the lake, even sometimes among the dwellings. The second species, though not found among the houses, occurs in great concentrations in the flooded and marshy forests around the estuaries of the little rivers which flow into the lake, situations much frequented by the fishers. Samples of tsetse from such a situation showed a percentage of infection with *T. gambiense* which varied from 14 per cent. in November 1954, to 5 per cent. in March 1956 (200 and 100 flies, respectively). This was diagnosed by the frequency of salivary gland infection and by the appearances presented by the parasites on stained slides. Cases of trypanosomiasis proved, however, rare and were noted as showing little symptoms of the disease. The author suggests that we have here an instance of Gambian sleeping sickness of low pathogenicity in an exceptionally well-nourished and healthy population; he draws a parallel between this and cattle trypanosomiasis, well tolerated when nutrition is favourable and often only appearing at the end of the dry season.

W. H. Potts

ROBERTSON, Muriel. Some Aspects of Trypanosomiasis with particular reference to the Work of Sir David Bruce. *J. Trop. Med. & Hyg.* 1956, Apr., v. 59, No. 4, 69-77. [18 refs.]

This Manson Lecture, delivered by the author, is devoted to various aspects of human and animal trypanosomiasis, with special reference to the pioneer work of Sir David BRUCE, who was in charge of the Sleeping Sickness Commission of the Royal Society in tropical Africa between 1900 and 1914. After reviewing the investigations carried out by Bruce and his team of workers (to which the lecturer herself made valuable contributions) she discusses the present state of our knowledge of the pathogenic trypanosomes and the diseases caused by them, on the one hand, and of the non-pathogenic trypanosomes, on the other, with special emphasis on the host-parasite relations in the infections. This review

thus provides a historical background to studies in trypanosomiasis. It does not lend itself to abstracting but students of this subject will both enjoy and derive benefit from reading the original.

C. A. Hoare

EVENS, F., with the technical collaboration of C. NIEMEGEERS. Étude comparative entre des souches de *T. gambiense* de la région de Léopoldville et les souches provenant du foyer de trypanosomiase à *T. rhodesiense* du Ruanda-Urundi. [Comparative Study of *T. gambiense* Strains from Léopoldville and *T. rhodesiense* Strains from Ruanda-Urundi] *Ann. Soc. Belge de Méd. Trop.* 1956, Feb. 29, v. 36, No. 1, 71-86.

In order to verify whether outbreaks of human trypanosomiasis reported from Ruanda-Urundi, near the Tanganyika border [this *Bulletin*, 1956, v. 53, 293] were in fact due to *Trypanosoma rhodesiense* (to which the disease was attributed), the author made a comparative study of strains received from the region in question and of *T. gambiense* in the area of Léopoldville.

As the result of this investigation he was able to confirm that both the clinical symptoms and the epidemiology of the disease in Ruanda-Urundi conform to the Rhodesian type of trypanosomiasis. The disease, which was presumably introduced from Tanganyika, appeared suddenly and was spread among a sedentary population by *Glossina morsitans* (*G. palpalis* is absent in the affected area). The trypanosomes were numerous in the peripheral blood of the patients, whose glands were small and usually hard. There was rapid invasion of the central nervous system and of the cerebrospinal fluid.

Morphologically the trypanosomes resembled *T. rhodesiense*, in that numerous postero-nuclear forms were present in laboratory rodents. The trypanosomes were very virulent to these animals, producing a fatal infection of short duration with high parasitaemia.

The response of these strains to trypanocidal drugs also corresponded to that of *T. rhodesiense*, viz., they were less sensitive to Bayer 205 than *T. gambiense*, and were not affected by doses of tryparsamide, pentamidine and nitrofurazone which cured infections with the last-named species.

It is concluded that the epidemic in Ruanda-Urundi was due to *T. rhodesiense*, the presence of which in the Belgian territories of Africa is reported for the first time.

C. A. Hoare

JENKINS, A. R. & GRAINGE, E. B. The Oxidative Metabolism of African Pathogenic Trypanosomes. I. Observations on *Trypanosoma rhodesiense* maintained by Sub-Inoculation and Cyclical Tsetse-Fly Transmission. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 481-4.

The authors have compared the respiratory rate of an old laboratory strain of *Trypanosoma rhodesiense*, maintained by syringe passage, with

those of freshly isolated strains capable of transmission by the insect vector. Heart blood of rats and guineapigs was collected in sodium citrate and centrifuged at 1,500 r.p.m. for 1 minute. The trypanosomes remaining in the supernatant were counted and their numbers per ml. adjusted by the addition of buffer salts and bovine plasma with added glucose. Respiration was measured in a conventional manner in Warburg flasks at 37°C. over a period of 1 to 2 hours. It was found that the mean oxygen uptake of the old strain was significantly greater than that of the recently isolated strains. The old strain, unlike the others, did not infect man, guineapig or *Glossina morsitans*. It was monomorphic and had a shorter incubation period in rats. The presence of M/300 KCN did not, however, affect the oxygen uptake of any of the strains.

[There is general agreement among workers in this field on the desirability of using freshly isolated strains of trypanosomes for metabolic studies. It would be interesting to know the cellular components of the authors' suspensions which were present with the trypanosomes. The abstracter and colleagues found that abnormally large numbers of white cells and platelets accompanied the trypanosomes in a freshly isolated strain of *T. rhodesiense*. Methods of preparing trypanosomes essentially free of other cells have been described by us when studying the radioactive balance of products of catabolism in various strains of *T. rhodesiense* with the use of ^{14}C -labelled glucose, and the descriptions will shortly appear in the *Biochemical Journal*.]

J. D. Fulton

WILLETT, K. C. An Experiment on Dosage in Human Trypanosomiasis.

Ann. Trop. Med. & Parasit. 1956, Mar., v. 50, No. 1, 75-80, 1 fig.

Working with a strain of trypanosomes which—though believed to be non-infective to man—accidentally infected 2 persons, the author set out to determine the dose which would infect human beings, by subcutaneous inoculation of blood taken from an infected rat and diluted with Ringer's glucose solution to produce the required number of trypanosomes in an inoculum of 1.0 or 0.5 ml. The infectivity of the strain was checked by inoculation of 8 men with 0.6 to 20 million organisms, while the minimum infective dose was determined by inoculating 7 men with 10 to 80,000 trypanosomes. Since all the men receiving 80,000 and more trypanosomes became infected, while those receiving 20,000 or less were not infected, the infective dose lies somewhere between these two figures. Intermediate doses were not used. In the course of these experiments it was shown that there was a linear decrease of the incubation period as the dose of trypanosomes increased on a logarithmic scale: this correlation is evident from the accompanying graph.

In discussing the results the author makes the following observations. (1) There is an apparent inconsistency between the minimum infective dose (80,000) obtained experimentally and the fact that accidental infections from a contaminated syringe actually took place, but it is pointed

out that 200,000-2,000,000 trypanosomes could be thus injected. (2) From the linear relation between incubation period and dosage of trypanosomes, it is concluded that the incubation period could be reduced to zero if a large enough number of trypanosomes were injected. This was in fact produced by intravenous inoculation of a rat with 300 million trypanosomes, which resulted in immediate parasitaemia. From the data contained in the graph, it is estimated that the number of trypanosomes present in the body of the host, at the time when they are first detectable in the blood, is 80 per cmm., which is equivalent to about one per 12 fields of a fresh preparation under 1/6 objective or one per 50 fields of a stained thick film. (3) There is a constant time interval (mean 2.6 days) from the onset of a reaction at the site of inoculation and the first appearance of trypanosomes in the blood. (4) There is possibly a critical period within which an infection becomes established, depending either on the trypanosomes or the host's defence mechanisms. Finally (5) the infective dose of metacyclic trypanosomes is considered: since *Glossina pallidipes* ejects much larger numbers than *G. morsitans*, it is suggested that the virulence of the human trypanosome might increase as the result of progressive reduction of the incubation period produced by inoculation of heavy doses of trypanosomes. "May it be," the author asks, "that the recent appearances of the Rhodesian type of sleeping sickness in association with *G. pallidipes* can be related to high dosage?"

C. A. Hoare

JEWELL, G. R. **Marking of Tsetse Flies for their Detection at Night.**
[Correspondence.] *Nature*. 1956, Oct. 6, v. 178, 750.

Mosquitoes have been watched at a distance of some 10 ft. by dusting them with non-toxic materials which fluoresce in ultraviolet light at night [this *Bulletin*, 1948, v. 45, 136]. The thorax of tsetse flies has been marked with oil paints [*ibid.*, 1953, v. 50, 800] but luminous paint that shines without excitation by ultraviolet radiation proved to be poisonous to tsetse flies and gave too feeble a glow.

The authors found BTH "Dayglo" (silica-based organic dyes in ethyl cellulose) powders mixed with a binder and solvents to be a satisfactory paint. The ultraviolet lamp used was worked off 230 volts AC: it is noted that a source has been developed which can be worked off a 6-volt battery. The paint was applied to the centre of the thorax, fouling of head and wings being avoided.

Treated flies shone brilliantly at 15 ft. in the ultraviolet beam, with a maximum range of 20 ft. The lamp produced much visible light and filtering out the glare might well increase this range. "Dayglo" paints, excited by ultraviolet radiation, have a visible glow from 8 ft. in daylight. The ultraviolet light did not seem to disturb *Glossina morsitans* unduly.

The method appears to be promising for locating tsetse flies at night.

H. J. O'D. Burke-Gaffney

VAN DEN BERGHE, L. & LAMBRECHT, F. L. Détermination des repas de *Glossina morsitans*, West. dans le Mutara (Ruanda). [Identification of Blood Meals of *Glossina morsitans* in Mutara, Ruanda] *Ann. Soc. Belge de Méd. Trop.* 1956, Apr. 30, v. 36, No. 2, 191-6. [11 refs.]

This paper records, in considerable detail, the identification by means of precipitating antisera, of 61 blood meals of *Glossina morsitans* collected in the Mutara (North Ruanda) region. The antisera available for these identifications did not include all the possible hosts; among the absentees were buffalo and hippopotamus sera. Not all the blood meals were tested against all the sera, but information supplied allows the reader to determine how many were actually tested against any particular animal. The tests indicated that the flies had fed on wart-hog, topi, man, eland, a felid, waterbuck, zebra and oribi. As in previous work of this nature [see this *Bulletin*, 1956, v. 53, 416 and 865] wart-hog is indicated as the favoured host (although only 14 out of the 61 blood meals were tested against this animal); again attention is drawn to the absence of feeds on impala, in spite of its abundance in the area.

[The report of feeds on zebra and topi must be viewed with suspicion in view of previous failures to find this species of tsetse feeding on the first of these animals, or on that close ally of the second, the kongoni, even in areas where these animals were abundant; unfortunately the methods are not described in sufficient detail to allow the reader to come to any certain conclusion on this point.]

W. H. Potts

VAN DEN BERGHE, L. & LAMBRECHT, F. L. Notes écologiques et biologiques sur *G. pallidipes* dans le Mutara (Ruanda). [Ecological and Biological Observations on *Glossina pallidipes* in Mutara, Ruanda] *Ann. Soc. Belge de Méd. Trop.* 1956, Apr. 30, v. 36, No. 2, 205-9.

In the Mutara region in Ruanda *G. pallidipes* is associated with 4 different kinds of vegetation, which are described; all are characterized by the presence of thickets of various kinds. Trees mentioned in connexion with one or other of the vegetation types were *Acacia sieberiana*, *A. campylacantha* and *Euphorbia candelabrum*. One of these types, noted as a feeding ground (whereas the others were rather true habitats), was characterized by xerophilous plants; a connexion with drainage lines and riverine thickets is mentioned in one area, and with anthill thickets in another. Further observations are considered necessary before the importance to the fly of these plant associations can be determined. *G. pallidipes* is noted as being more active in morning and evening, and a single instance of its attraction to light at night is recorded. This species is considered to present peculiar problems of its own, distinct from those presented by *G. morsitans*. Its importance in cattle trypanosomiasis and Rhodesian sleeping sickness is stressed.

W. H. Potts

GALLAIS, P., COLLOMB, H., MILETTO, G., DUTERTRE, J. & BÉRARD-BADIER.

L'apport de la pneumo-encéphalographie dans l'interprétation et le classement de l'encéphalite de la trypanosomiase humaine africaine. Intérêt doctrinal et thérapeutique. [Pneumo-Encephalography in the Interpretation and Classification of Encephalitis in African Trypanosomiasis] *Méd. Trop.* Marseilles. 1956, Jan.-Feb., v. 16, No. 1, 5-46, 19 figs.

The authors have studied 20 patients (all but one of them Africans) suffering from trypanosomiasis [presumably *T. gambiense*] with central nervous system involvement. Their chief interest lay in the investigation of the changes in the central nervous system; among other examination techniques they employed electro-encephalography and pneumo-encephalography. Four of the patients died in spite of specific treatment, and this made full anatomical and histological studies possible. The findings in each of the 20 cases are set out in considerable detail. These should be consulted in the original by those interested. As a result of these and earlier studies [this *Bulletin*, 1953, v. 50, 488] the authors arrived at the following conclusions.

Trypanosomal invasion speedily produces an immunological response akin to a reactional myelomatosis. The brain shares in this reaction; hence the perivascular cellular response, which in fact precedes the changes later to be found in the cerebrospinal fluid. The parasitic invasion and the response to it seek an equilibrium; this response, being of an allergic nature, fluctuates; this explains the notoriously capricious progress of the disease. After a variable period the disease becomes predominantly cerebral in its manifestations, as it increasingly attacks the brain and its coverings. If untreated it progresses finally to the fatal stage of a leuco-encephalitis.

Pneumo-encephalography indicates that changes occur in the pericerebral fluid before they become evident in the spinal fluid obtained on lumbar puncture. The morphological changes in the brain are constant and are characteristic when the encephalitis becomes established. They take the form of a subcortical periventricular atrophy with dilatation of the lateral ventricles, of the 3rd and 4th ventricles, of the Sylvian aqueduct, and of the basal cisterns. There is always involvement of the brain stem.

All of 16 patients apparently freed from parasites by treatment had residual neuro-psychic changes; these were evident on pneumo-encephalography. Histopathological studies of the brains of the remaining 4 patients, who died in spite of trypanocidal treatment, showed a leuco-encephalitis with demyelination. All the findings point to this as a characteristic terminal immunological reaction in the brains of sleeping sickness patients. It is suggested that in the treatment of trypanosomiasis account should be taken of this tendency to the development of an allergic type of reaction by the administration of powerfully anti-allergic drugs, such as cortisone, when treating the patient with trypanocidal drugs.

The authors state that preliminary trials of such a system of treatment support this contention.

A. R. D. Adams

VAN DEN BERGHE, L. & LAMBRECHT, F. L. Moyens d'action contre les *Glossina morsitans*, West. dans le Mutara (Ruanda). [Control of *Glossina morsitans* in Mutara, Ruanda] *Ann. Soc. Belge de Méd. Trop.* 1956, Apr. 30, v. 36, No. 2, 197-203, 1 map.

In this paper a scheme is outlined for the control of *G. morsitans* in the north Mutara region of Ruanda Urundi. It is based on a complete year's study, by means of fly rounds. This related the numbers of fly caught and their state of hunger to the different vegetation communities present in the area, and so showed which of these constitute the real and permanent habitats of the fly. The plan proposed is essentially one of selective clearing akin to that used with success in Ankole, Uganda, and in Tanganyika Territory. It is estimated to require clearing operations in about one-third of the total area. This third comprises the wooded savannah in the valleys surrounding 3 hills in the region, but does not entail their complete clearance. Only the acacias of 4 species (*A. hebecladoides*, *A. campylacantha*, *A. senegal*, and *A. sieberiana*) which exceed 4 metres [about 13 feet] in height would be felled; the infrequent trees of this size of other species of *Acacia*, and of other genera such as *Combretum* and *Albizzia*, would be left uncut, as would the riverine gallery forests, at any rate until the results of the first clearing were apparent.

Details of the cost of the operations are discussed; an estimate of just under 6 shillings an acre, based on the Uganda experience, is considered to be on the high side for Ruanda conditions, so far as could be judged from the number of trees which aerial photographs showed would have to be cleared, and the time that actual observation showed was likely to be needed to fell the trees of these 4 species of *Acacia*. Details of this are given.

The rare occurrence of *G. pallidipes* in the area is noted, but at the present stage of study of its ecology and biology [see above] the authors could not draw any conclusion as to whether the operations against *G. morsitans* will also result in the disappearance of this second species.

W. H. Potts

TOBIE, Eleanor J. & HIGHMAN, B. Influence of the Amino Nucleoside of Puromycin on the Course and Pathology of Trypanosome Infections in Rabbits and Mice. *Amer. J. Trop. Med. & Hyg.* 1956, May, v. 5, No. 3, 504-15, 11 figs. [18 refs.]

Puromycin [Stylomycin] is reported to be an effective trypanocide in experimental animals and therapeutically active against *Trypanosoma gambiense* infections in man [see this *Bulletin*, 1953, v. 50, 690; 1955,

v. 52, 134, 615]. Studies on *T. equiperdum* infections in mice suggest that puromycin and its amino nucleoside interfere with purine metabolism and the synthesis of nucleic acid or nucleoproteins [*ibid.*, 1955, v. 52, 518]. The amino nucleoside is an active component of the puromycin molecule, and this paper is a report on the effect of this component on certain representative species of trypanosomes. The trypanosomal infections selected were those due to *T. gambiense* and *T. rhodesiense*, *T. congolense*, and *T. equinum*. Swiss mice and New Zealand white rabbits were the animals used. The details of toxicity of the drug and of the modes of infection, their progress, and of treatments used should be sought in the text.

In a table are set out details of experiments which show the effect of different doses of the amino nucleoside of puromycin on varying intensities of infection with each of the 4 trypanosomes in mice. A single dose of 80 mgm./kgm. was found to be effective against *T. gambiense* infections [0 of 35 mice relapsed when treated on the 1st day; 1 of 35 treated on the 2nd day; 2 of 45 treated on the 3rd day; and 1 of 5 relapsed when treated on the 4th day]. *T. equinum* and *T. rhodesiense* infections did not respond as well as did that due to *T. gambiense* when treatment began on the 2nd, 3rd or 4th days of infection. *T. congolense* infections, though less rapidly fatal to mice even after a bigger inoculum, responded least satisfactorily [13 of 20 mice relapsed when treated on the 1st day; 13 of 20 on the 2nd day; 15 of 20 on the 3rd day; 13 of 20 on the 4th day; 2 of 3 mice relapsed when treated on the 7th day]. Nevertheless, in the case of all infections, whatever the parasite, the blood was freed of parasites for several days after the drug was given.

In another table are set out the results of the same treatment on mice following variation in the size of the infecting inoculum with *T. gambiense*. A larger inoculum and delay in treatment lessened the chance of cure. There seemed to be a sex difference in the response to the drug; a greater proportion of males (5 in 10) relapsed than did females (1 in 10). Some of the male mice when they relapsed were treated with the same dose (80 mgm./kgm.) of amino nucleoside on up to 9 occasions, in an endeavour to produce resistance to the drug. In each instance the blood still was cleared of parasites by the drug, but the negative periods shortened. Some female mice treated with 40 mgm./kgm. of the drug relapsed, and successive passage mice from these were given 80 mgm./kgm.; though relapses followed in some of these a cure was still achieved in the 10th passage; this, it is considered, shows that no true drug resistance was developed in the *T. gambiense* strain used.

The course of a *T. gambiense* infection in rabbits is slowly progressive and is characterized by a low parasitaemia, in contrast to its rapidity and high parasitaemia in mice. Lesions around the eyes, nose and ears appear within a couple of weeks; these do not clear on ordinary antibiotic treatment (penicillin and streptomycin), and so are not due to secondary infection. Rabbits die between 43 and 63 days after infection.

Treatment of infected rabbits with amino nucleoside was usually delayed until the 50th day of the infection. Nine animals were treated with 20 to 40 mgm./kgm. of the compound on 1 to 14 occasions; 3 died during or at the completion of treatment; 1 relapsed; and 5 apparently were cured. These 5 each had had at least 200 mgm./kgm. of the drug, whereas all but one of the other rabbits had had substantially less.

Histological studies were made of the tissues of mice and rabbits infected with *T. gambiense*. In the case of mice in which the duration of the infection was prolonged by repeated relapse following non-curative treatments, post-mortem changes were found in the central nervous system which resembled those known to occur in man. The successful production of these lesions in the ordinary small laboratory animals may well facilitate study of the chemotherapy of advanced stage *T. gambiense* infection in man.

A. R. D. Adams

EDWARDS, E. E., JUDD, J. M. & SQUIRE, F. A. **Observations on Trypanosomiasis in Domestic Animals in West Africa. I.—The Daily Index of Infection and the Weekly Haematological Values in Goats and Sheep infected with *Trypanosoma vivax*, *T. congolense* and *T. brucei*.** *Ann. Trop. Med. & Parasit.* 1956, Sept., v. 50, No. 3, 223–41, 4 figs. [11 refs.]

EDWARDS, E. E., JUDD, J. M. & SQUIRE, F. A. **Observations on Trypanosomiasis in Domestic Animals in West Africa. II.—The Effect on the Erythrocyte Sedimentation Rate, Plasma Protein, Bilirubin, Blood Sugar, Red-Cell Osmotic Fragility, Body Weight and Temperature in Goats and Sheep infected with *Trypanosoma vivax*, *T. congolense* and *T. brucei*.** *Ann. Trop. Med. & Parasit.* 1956, Sept., v. 50, No. 3, 242–51, 1 graph.

VICENTE SCORZA B., J. & DAGERT BOYER, Cecilia. **Estudio comparativo de las curvas parasitarias del *Trypanosoma venezuelense* en ratones blancos y cobayos.** [Comparative Study of Parasitaemia in Mice and Guinea-pigs infected with *Trypanosoma venezuelense*] *Gac. Méd. de Caracas.* 1955, May–June, v. 62, Nos. 5/6, 169–88, 7 graphs & 1 chart. [20 refs.] English summary (8 lines).

Since the action of trypanocidal drugs is assessed by their effect upon the course of infection in susceptible animals, the authors have made a comparative statistical study of the normal behaviour of *Trypanosoma venezuelense* [= *T. evansi*] in experimental infections of mice and guinea-pigs. The degree of parasitaemia was determined by examination of the trypanosomes by phase contrast microscopy, by counts made with the aid of a haemocytometer, and in Giemsa-stained blood films. The rate of

multiplication of the trypanosomes was calculated from the formula $A_n = A_0 \times 2^{n-1}$, in which A_0 = number of trypanosomes at the beginning of the observation, A_n = their number at the end, $n-1$ = number of binary divisions during the period of observation.

The results, given in tables and curves, were as follows. Mice and young guineapigs showed no evidence of resistance to the infection, which is characterized by progressive parasitaemia after an incubation period from 2 to 4 (average 3.3) days, depending upon the number of trypanosomes inoculated. The infection terminated in the death of the host when the density of parasitaemia reached 1,200,000 trypanosomes per cmm. of blood. The interphase between divisions was found to vary between 1 hour 18 minutes and 24 hours (average 7 hours 33 minutes). In adult guineapigs parasitaemia increased until it reached a density of 180,000 trypanosomes per cmm. of blood, after which there was a trypanolytic crisis, resulting in the elimination of the majority of trypanosomes. Those that survived multiplied again until a new peak of parasitaemia was reached, which, in its turn, was followed by another crisis. The number of such crises and the intervals between them varied, but eventually the animal died with an average parasitaemia of one million trypanosomes. There was a marked drop in the number of dividing forms 24-48 hours before the crises.

C. A. Hoare

DIAS, E. Variações mensais da incidência das formas evolutivas do *Triatoma infestans* e do *Panstrongylus megistus* no Município de Bambuí, Estado de Minas Gerais. [Monthly Variation in the Incidence of Developing Forms of *Triatoma infestans* and *Panstrongylus megistus* in Bambuí, Brazil] Mem. Inst. Oswaldo Cruz. 1955, June–Sept.–Dec., v. 53, Nos. 2, 3 & 4, 457–72, 8 graphs. [13 refs.] English summary.

An analysis is made of aggregate data pertaining to the incidence of the two principal vectors of *Trypanosoma cruzi* in Brazil, which were captured over a 10-year period in the municipality of Bambuí. A total of 147,826 of these triatomids comprised 138,905 (94 per cent.) *T. infestans* and 8,921 (6 per cent.) *P. megistus*. The species occurred in similar proportions in urban as opposed to rural localities, but were much more frequently encountered separately than together.

The results, given graphically and in tabular form, show a seasonal distribution of the various developmental stages as follows. Highest relative numbers for *T. infestans* occurred during October–December (larvae), January–June (nymphs) and July–August (adults); for *P. megistus*, the corresponding principal distribution occurred during February–April (larvae), May–September (nymphs) and October–December (adults). In addition, *P. megistus* showed a constant graphical intersection between an increase in adults and decrease in immature forms during August–September, with a strong tendency to a

second similar (but reverse) intersection during December–February; this did not occur in *T. infestans*, except for an occasional approximation during July–August, correlated with increasing adult and decreasing juvenile frequencies.

Correlation with climatic conditions, and with the seasonal incidence of Chagas's disease, shows that late nymphs and adult *T. infestans* are predominant during the dry and cool season, and adult and larval *P. megistus* predominate during the wet and hot season. The main incidence of Chagas's disease is concurrent with the latter.

N. R. Phillips

DIAS, E. & ZELEDÓN, R. Infestação domiciliária em grau extremo por *Triatoma infestans*. [Heavy Infestation of a Hut with *Triatoma infestans*] *Mem. Inst. Oswaldo Cruz*. 1955, June–Sept.–Dec., v. 53, Nos. 2, 3 & 4, 473–86, 7 figs. English summary.

A small mud hut, known to be densely infested by Triatominae, was initially observed in 1951, when 2,505 *T. infestans* and 3 *P. megistus* were obtained by 26 applications of pyrethrum powder. In 1954, 4,645 *T. infestans* and 1 *P. megistus* were similarly collected, followed by a further 1,398 *T. infestans* in 1955, when the hut was destroyed.

Indices of infection with *T. cruzi* of the *T. infestans* taken were 37.7 per cent. (adults 61.5 per cent., nymphs 33.3 per cent.) in 1951, and 6.5 per cent. (adults 9.4 per cent., nymphs 3.5 per cent.) in 1954; these differences are statistically significant.

All the 6 human inhabitants of the hut were positive for *T. cruzi* by complement fixation, and 4 of them gave positive xenodiagnoses. Clinical details are given.

N. R. Phillips

HALFF, Lily A. Untersuchungen über die Abhängigkeit der Entwicklung der Reduviide *Triatoma infestans* Klug von ihrem Darmsymbionten. [Studies on the Development of *Triatoma infestans* with its Symbionts] *Acta Tropica*. Basle. 1956, v. 13, No. 3, 225–53, 8 figs. [Numerous refs.]

This investigation into the physiology of the gut flora of *T. infestans* appreciably advances on the data in a recent publication by GOODCHILD [see this *Bulletin*, 1956, v. 53, 427] from a biochemical viewpoint. Studies here, however, were confined to the principal symbiont, *Nocardia (Actinomyces) rhodnii*.

For experimental purposes, bugs were maintained at 26°C. and 65 per cent. relative humidity and fed upon guineapigs or, artificially, on sterile media to which various vitamins and test-substances had been added. Symbiont cultures were made on glucose-agar media, with the addition of human blood; these became haemolysed after 10–12 hours.

Symbiont-free bugs had a considerably delayed development in

comparison with normal controls, and only 0.3 per cent. reached the adult stage. Of several antibiotics tested for sterilizing purposes, only oxytetracycline was effective; symbionts were not found in bugs 12 days after being artificially fed on guineapig serum containing this substance.

Pure *in vitro* cultures of the symbiont showed that folic acid was the main constituent produced. Folic acid, at concentrations of 0.1 μ gm. and 0.01 μ gm. per ml. of guineapig serum was then artificially fed to sterile and normal bugs, and found to promote growth. This growth promotion could be inhibited by subsequent feeding with serum containing 0.1 μ gm. to 10 μ gm. of aminopterin, a folic acid antagonist. Folic acid therefore appears to be largely responsible for the deficiencies correlated with bugs deprived of their bacterial symbionts.

N. R. Phillips

NUSSENZWEIG, V., AMATO NETO, V., DE FREITAS, J. L. P., NUSSENZWEIG,

Ruth S. & BIANCALANA, A. Moléstia de Chagas em bancos de sangue.

[**Chagas's Disease and Blood Banks**] Reprinted from *Rev. Hosp. Clínicas*. 1955, July-Aug., v. 10, No. 4, 265-83. [39 refs.] English summary.

The question of transmission of *Trypanosoma cruzi* in transfused blood has already received attention in Brazil [see, for instance, this *Bulletin*, 1954, v. 51, 894, 1046; 1955, v. 52, 22]. In the present paper the authors sum up earlier work in which positive complement-fixation reactions were reported in up to about 20 per cent. of the specimens examined. They report on 178 blood samples tested in São Paulo, of which 3 were found to be positive and 7 doubtful. They give an account also of 25 donor candidates with Chagas's disease, of whom 24 were diagnosed by the complement-fixation test and 1 by xenodiagnosis, and they point out that in the majority there was no clinical sign or symptom which would have suggested the disease, but in 9 the electrocardiogram showed evidence of defective conduction, in 1 there was right complete bundle-branch block, and in 6 there was X-ray abnormality of the heart.

They report on 13 persons who received transfusions of blood from donors with positive complement-fixation tests, showing that 3 definitely (and 1 possibly) acquired the disease. Diagnosis in these 3 was made by xenodiagnosis in 2 (at 18 and 83 days after the transfusion), by direct examination in 2 (at 68 and 84 days), and by the complement-fixation reaction in 2 (at 90 and 60 days). The time during which the blood was stored in the ice-box was 14 or 15 hours in 2 of the infected persons; in the third it was not known.

The authors found, in experiments with infected mouse blood, that crystal violet has no advantage over gentian violet as a prophylactic, and they cite a large number of transfusions carried out in São Paulo with blood treated with gentian violet, in which the disease was not transmitted and there were no toxic reactions. Certain patients had received

blood which gave positive complement-fixation reactions, but to which had been added 25 ml. of 0.5 per cent. solution of gentian violet per 500 ml. blood, 24 hours before transfusion. None of the recipients contracted the disease. These results are promising, but the authors wish to extend their trials before advocating this treatment of blood as a safe measure of protection.

Charles Wilcocks

KÖBERLE, F. & NADOR, E. "Mal de engasgo". [**"Choking Disease"**]

—**Dilatation of the Oesophagus—in Chagas's Disease**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 259-77, 6 figs. [Numerous refs.]

The English summary appended to the paper is as follows:—

"Dilatation of the esophagus, known in Brazil as 'mal de engasgo', is a manifestation of Chagas disease as proved by a thorough study of serial tissue sections taken from 20 cases of mega-esophagus, also from 50 esophagi of current autopsy material, including 15 cases of Chagas disease, and from 10 more cases of schizotrypanum cruzi infection. Pathologic widening of other muscular tubes—colon, stomach, duodenum, ureter—often observed in Brazil must also be attributed to Chagas disease.

"It is shown in mega-esophagus cases that parasites carried by the blood into the esophagus tissues develop pseudocysts which rupture; the liberated parasites cause an interstitial inflammation spreading to the nervous plexus and traceable along the nervous texture to a far extent. The resulting destruction of the intramural plexus leads to disturbances of motility and, consequently, to muscular hypertrophy and widening of the esophagus lumen. The heavy damage of the plexus with necrosis of ganglion cells is the neurotoxic effect of an endotoxin set free by dying parasites in the interstitial tissue.

"Dilatation of tubular organs with muscular hypertrophy represents only one of the many manifestations of Chagas disease and results when the peripheral parts of the neurovegetative system are destroyed. This effect must be kept in mind fully to understand the peculiar and many-sided symptomatology of Chagas disease."

ZELEDÓN, R. Hallazgo de formas evolutivas de *Trypanosoma rangeli*

Tejera, 1919, en glándulas salivares de *Rhodnius prolixus* Stal, 1859, salvadoreños. [**Discovery of Developmental Forms of Trypanosoma rangeli in the Salivary Glands of Rhodnius prolixus in Salvador**] *Rev. Biología Trop.* San José, Costa Rica. 1956, July, v. 4, No. 1, 1-7, 17 figs. [12 refs.]

The English summary appended to the paper is as follows:—

"The author deals with the finding of developmental forms of

Trypanosoma rangeli Tejera in the salivary glands of *Rhodnius prolixus* of El Salvador, Central America.

“ Some considerations are made concerning the morphology of metacyclic trypanosomes and of the large Crithidia, which resemble Roubaud's 'cercoplasma' in that they attain lengths of over 100 μ in some instances, and in the great development of their posterior ends.

“ Some remarks are made on the interesting cycle of this trypanosome in insects.”

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

CLAY, R. D. & ROSS, A. A. **Tardive Cutaneous Leishmaniasis.** [Memoranda.] *Brit. Med. J.* 1956, June 2, 1279-80.

After quoting previous records of a prolonged incubation period in cutaneous leishmaniasis, extending in some cases over 5 years, the authors describe a similar case observed by them in a Portsmouth hospital. The patient, who had a swelling on the forearm, which first made its appearance 6 months earlier, attended the dermatological department at the end of July 1953. Sections of material removed by excision biopsy revealed the presence of numerous Leishman-Donovan bodies within histiocytes of the lesion, which had the characteristics of ulcerated intra-dermal granuloma. As the patient had not been abroad since the end of 1942, when he returned to Britain after serving in the Middle East from 1940 to 1942, it is reckoned that in this case the incubation period of oriental sore exceeded 10 years. The authors suggest that residence in a temperate climate might be one of the factors responsible for exceptional prolongation of the incubation period in this disease. *C. A. Hoare*

MINCULESCU, M., BÎRZU, I., CREȚU, S., IOVANESCU, F., IONESCU, D., LUPULESCU, V., MICHEL, G., PAULON, S., ROTARU, A., RUSOVICI, I. & ZAHARIA, C. Consideratii asupra primului focar de leishmanioză infantilă identificat în R.P.R. [Observations on the First Focus of Infantile Leishmaniasis recognized in Rumania] *Studii și Cercetări Inframicrobiol., Microbiol. e și Parazitol.* 1955, July-Dec., v. 6, Nos. 3/4, 595-603, 7 figs. (2 on pl.). French summary.

A description is given of 3 cases of infantile leishmaniasis from an endemic focus recently discovered in the Craiova district of Rumania. One patient was a boy aged 1 year 11 months, who had enlargement of liver and spleen, prolonged intermittent fever, loss of weight and

abdominal distension. The haemoglobin level was 25 per cent. of normal and the red cell count was 2 million per cmm. Treatment with Fouadin was ineffective and death occurred 16 days later. At autopsy the parasites were found in smears of spleen, liver, lungs, kidneys and mesenteric lymph nodes. The second was a boy aged 2 years with similar symptoms of 6 months' duration. The haemoglobin level was 50 per cent. and the red cell count was 2,250,000 per cmm. Parasites were found in smears of marrow obtained by sternal puncture. The third was a boy aged 1 year 8 months, with fever, enlargement of liver and spleen, abdominal enlargement and purpura. The haemoglobin level was 24 per cent. and the red cell count was 2 million per cmm.; leishmaniae were found in smears of sternal marrow. The condition improved after treatment with Fouadin.

The source of infection could not be found. The Craiova district is adjacent to the Vidin and Lom districts of Bulgaria, where leishmaniasis is known to occur.

D. J. Bauer

KIRK, R. **Studies in Leishmaniasis in the Anglo-Egyptian Sudan. XII. Attempts to find a Reservoir Host.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Mar., v. 50, No. 2, 169-77. [39 refs.]

Kala azar in the Sudan has certain epidemiological features which suggest that the infection is harboured in nature by some animal reservoir host. A number of previous workers have searched for such a host, but with negative results. The present author has also been concerned with this problem, but was likewise unable to find a true animal reservoir. However, the results of his observations are recorded here for the benefit of future investigators.

Apparent circumstantial evidence of an animal reservoir was provided by outbreaks of kala azar among Sudanese troops stationed in practically uninhabited country. It is pointed out, however, that the outbreaks might have been due to activation of latent cases among the soldiers, or to the presence among them of cases with post-kala-azar dermal infections which were spread by local sandflies. At different times, over 100 monkeys (baboons, vervets, hussar and *Colobus*) were examined for leishmanial infection, with negative results. However, parasites were found in the spleen of a *Cercopithecus* experimentally infected with the blood of a patient suffering from relapsing fever, but there was no evidence as to whether the infection in the monkey was acquired in the wild state or from the patient. There is an isolated record of leishmanial infection in a horse from the Sudan [this *Bulletin*, 1936, v. 33, 27], but examination of skin smears from many donkeys, with symptoms resembling dermal leishmaniasis in dogs, failed to reveal leishmaniae. The examination of numerous burrowing rodents (especially gerbils) also gave negative results. A doubtful case of cutaneous leishmaniasis was observed in 1 out of 4 foxes.

(*Vulpes pallida*) examined. Although 120 dogs were examined with negative results, the presence of canine leishmaniasis in the Sudan cannot be excluded, in view of the close association of these animals with man in certain endemic areas of kala azar. On the other hand, the existence in the Sudan of post-kala-azar dermal leishmaniasis might indicate that human carriers serve as the reservoir of the infection. *C. A. Hoare*

See also p. 238, MITRA, **Notes on Sandflies, Sandflies of Poona District.**

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

SIENNICKI, W. Badanie swoistości odczynu Weil-Felix i odczynu wiazania dopełniacza z riketsjami duru plamistego. [Studies on the Specificity of the Weil-Felix Reaction and Complement-Fixation Reaction with *R. prowazekii*] *Med. Dośw. i Mikrob.* Warsaw. 1956, v. 8, No. 4, 495–510.

The English summary appended to the paper is as follows:—

“ From August 1953 to February 1956 six groups of persons were investigated by means of the Weil-Felix reaction: 1) 5293 patients suspected of suffering from enteric fever or other salmonelloses, 2) 1839 dysentery cases, 3) 536 patients suspected of suffering from leptospiroses or infectious hepatitis, 4) 80 brucellosis cases, 5) 70 syphilis cases, 6) 100 typhus fever cases and 7) 350 healthy persons. With the four last groups the complement fixation tests with Rickettsia antigens were made in all cases, with the three first groups only in a part of them. On the basis of the results the author demonstrates that: 1) the Weil-Felix test has no diagnostic value in sporadic cases of typhus fever; negative results or those positive to a low titre do not exclude a typhus fever, high titres do not prove it as well, 2) the complement fixation test with Rickettsia antigens is specific for typhus fever; with healthy persons it is almost always negative and with typhus cases it is positive in all cases, 3) with some cases with no relation to typhus fever nonspecific positive results of complement fixation tests are possible; their titres hardly exceed 1:100 if the persons in question never before suffered from typhus fever; 4) a titre as high as 1:200 is almost always evidence of typhus fever; such a titre can, however, be insufficient as evidence of relapse if the person in question did suffer from typhus fever in the past.”

ARCHETTI, I. & BABUDIERI, B. Ricerche sperimentalali su di un vaccino antidermotifico in sospensione oleosa. [Experiments with Anti-Typhus Vaccine emulsified in a Mineral Oil] *Rendiconti Istituto Superiore di Sanità*. Rome. 1956, v. 19, Pts. 4/5, 409-18, 1 fig. English summary.

The investigation was carried out with preparations from the lungs of albino mice which had been infected by the inhalation of *Rickettsia prowazekii* under anaesthesia. The effects of immunizing guineapigs with such suspensions when (a) suspended in saline and (b) in a preparation of mineral oils, were compared.

The preparation in mineral oil showed a marked superiority both in the titre of complement fixing and agglutinating antibodies developed and in the protection of guineapigs from the injection of live suspensions of *Rickettsia*.

The mineral oils used were Bayol F, which has been recommended by SALK *et al.* in preparing influenza vaccine [Bull. Hyg., 1951, v. 26, 1223] in combination with Arlacel to aid dispersion. Suspensions of the *Rickettsia* so obtained showed remarkable stability. J. W. McLeod

DOHERTY, R. L. **A Clinical Study of Scrub Typhus in North Queensland.**

Med. J. Australia. 1956, Aug. 11, v. 2, No. 6, 212-20, 4 figs. [15 refs.]

This report is based on a series of 53 patients with scrub typhus studied at the Innisfail Field Station of the Queensland Institute of Medical Research in the period from March 1953 to November 1954. *Rickettsia tsutsugamushi [orientalis]* was isolated from 45 of these patients by mouse inoculation. The strains isolated from 27 of this series were reported on by CARLEY *et al.* [this Bulletin, 1955, v. 52, 1180]. *Proteus* agglutination tests were performed on paired sera from all patients and supported the diagnosis in the 8 cases from which no *Rickettsia* were isolated.

A useful table sets out the frequency of incidence of the clinical features, including headache (in 48), lymphadenopathy (38), rash (24), primary eschar (19), photophobia (18), cough (14), liver tenderness (13) and generalized myalgia (10). Albuminuria was only found in 8 cases and splenomegaly in 4.

Forty-five patients were treated with chloramphenicol, 2 with tetracycline and 1 with chlortetracycline. The general clinical picture was of a mild illness which is attributed to the chemotherapy. There were no deaths. The mode of onset varied; where it was sudden the clinical picture suggested leptospirosis. Patients infected with strains which proved virulent on mouse passage sought hospital admission earlier in the illness than others.

The rash was maximal on the trunk in all cases. In 1 patient it appeared for the first time during a relapse, in another it reappeared

during a relapse. One patient exhibited a confluent pustular eruption on the back from which *Staphylococcus aureus* was isolated. Similar eruptions were noted by WILLIAMS *et al.* [*ibid.*, 1945, v. 42, 369].

Respiratory tract involvement was noted in 14 cases and one patient was severely ill with X-ray changes suggestive of disseminated tuberculosis. This patient responded well to chloramphenicol and the lung fields cleared.

Abnormal liver function tests were obtained but these are attributable to antibody response, not liver damage as noted by SATO *et al.* [*ibid.*, 1955, v. 52, 30].

Nine patients exhibited a secondary rise of fever suggestive of a relapse and in an additional 10 there was a brief rise not lasting for longer than 24 hours. No patient in whom treatment was delayed until the 9th day relapsed; in the remainder there was no constant relationship to the time of treatment, dosage or strain virulence.

Seventeen patients did not develop agglutinins against *Proteus OXK* and in 7 others a diagnostic titre was not reached.

Frederick J. Wright

FUJITA, H., SUZUKI, T. & HORIKAWA, T. **Epidemiological Studies on 20 Days Fever in Mie-Prefecture. Part 1: On Rickettsia isolated in Mie-Prefecture.** *Mie Med. J.* 1956, May, v. 6, Nos. 1/2, 153-8, 1 fig.

This is a description of an epidemiological study of "unknown acute febrile diseases, so called 20 days fever or 2 weeks fever, Kameyana fever, etc.," which are prevalent in the Mie Prefecture, Japan.

Blood samples from 5 patients were inoculated into mice and various culture media with negative results, but Weil-Felix tests yielded positive results in "several" cases with *Proteus OX19* at titres of 1 in 320 to 1 in 1,280. In some of these cases complement-fixation tests with *Rickettsia mooseri* antigen were positive and a diagnosis of murine typhus was regarded as established. "A few" of the patients were tested against *Pr. OXK*; in some of these the reaction was positive at titres ranging from 1 in 80 to 1 in 640 and the response with *Pr. OX19* was negative. In view of the probable diagnosis of tsutsugamushi fever in these cases it was decided to attempt the isolation of *Rickettsia tsutsugamushi* from the local rodents.

From 32 pools of spleen suspensions prepared from 142 wild rodents 3 strains of this rickettsia were isolated by mouse inoculation. The identification was by the usual methods, including intraperitoneal inoculation of mice and guineapigs, yolk-sac cultures, intratesticular and intraocular inoculation of rabbits.

The rodents found infected were *Apodemus speciosus* and the localities in which these were found infected corresponded to those in which the mites *Trombicula scutellaris* and *T. pallida* occurred.

John W. D. Megaw

FUJITA, H., SUZUKI, T. & HORIKAWA, T. **Epidemiological Studies on 20 Days Fever in Mie-Prefecture. Part 2: On Trombiculid Mites in Mie-Prefecture.** *Mie Med. J.* 1956, May, v. 6, Nos. 1/2, 159-69, 1 fig. [22 refs.]

This paper is in continuation of the one immediately preceding it and is by the same authors. It contains a description of a survey of the Trombiculid mites and their hosts in the Mie Prefecture where the authors had found evidence of the occurrence of tsutsugamushi fever. In 31 localities of the Prefecture 16 species of Trombiculid mites were collected from 6 species of murine hosts. The paper contains tables which illustrate the geographical and seasonal distribution and the host-infestation rates of 5,854 mites collected from 144 rodents. Other tables show the types of terrain in which the mites were found: 2,262 were from 30 hosts in forest land; 1,167 were from 34 hosts in fields in open country and 1,129 from 14 hosts in residential areas. *Trombicula akamushi*, accepted as the major vector of tsutsugamushi fever in Japan was not found, but *T. scutellaris* and *T. pallida* which have been suspected of being vectors were found in the localities in which mice infected with *Rickettsia tsutsugamushi* were captured.

Further studies of the aetiology and special clinical and epidemiological features of the disease in this region are contemplated by the authors, who hope that these will clarify the relationship between the biology of mites and the epidemiology of the local variety of scrub typhus.

Reference is made to the remarkable fact that till recently the only known focus of the disease in Japan has been in the north-west of the Honshu Island though since the second world war cases have been found to occur in various parts of the country where they had formerly been regarded as "new" diseases and had been called by such names as those mentioned in the preceding paper.

A good summary of the recent advances of knowledge of the disease in Japan has been published by SASA [see this *Bulletin*, 1956, v. 53, 565].

John W. D. Megaw

MAZZITELLI, L. Sull'epidemiologia della febbre Q. [Epidemiology of Q Fever] *Acta Med. Italica.* 1955, Dec., v. 10, No. 12, 322-35. [157 refs.]

A review of the literature.

KOROLEV, P. A. & KOLOTYGINA, A. P. [Epidemiology and Clinical Aspects of Q Fever in the Crimea] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii.* Moscow. 1956, No. 7, 10-15. [In Russian.]

Between 1950 and 1952 a hitherto unknown febrile illness appeared in the Crimea; it was eventually identified as Q fever by serological tests

and isolation of the causative organism, and in the present work the authors have studied its clinical and epidemiological features.

A diagnosis of Q fever was established in 24 of 260 residents of the Crimea suffering from an acute febrile illness in 1954-55; agglutination titres of 16 or 32 were observed in 9, and complement-fixation titres of 20-160 in 15 instances. The onset was acute with fever, headache, pains in muscles and joints and occasionally anorexia, nausea and vomiting. Fever lasted for 3-10 days (22 days in one instance) and usually subsided by lysis; a roseolar exanthem was observed on the trunk and limbs in 2 instances. In most cases the disease was moderately severe and resembled a mild attack of typhoid fever. Complications and relapses were not observed. Treatment with antibiotics was ineffective. Many patients lived in Simferopol, and in an investigation of 115 workers in meat processing and allied occupations in the same area Q fever complement-fixing antibody was found in 4 instances (3.5 per cent.).

Infection was common in cattle, and antibody was found in 6.6 per cent. of 1,415 animals investigated, with an incidence of 13.5 per cent. in some herds, but the disease did not occur in epidemic form in man, and even in those most at risk only sporadic cases were observed.

D. J. Bauer

ZAITSEV, A. A. & POKROVSKAYA, E. V. [The Distribution of Q Fever in the Stavropol District (Preliminary Communication)] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*. Moscow. 1956, No. 7, 15-16. [In Russian.]

The results of an epidemiological survey carried out by the authors showed that Q fever complement-fixing antibody is widely distributed among healthy persons resident in the Stavropol district of the Crimea. In an investigation of 356 persons a titre of 10 or higher was found in 65 (18.3 per cent.), most of whom were engaged in occupations which brought them into contact with sheep or wool. Antibody was also present in 12 (11 per cent.) of 109 donors attending a regional blood transfusion centre, and in 27 (21.6 per cent.) of 126 persons of various occupations living in rural areas. Only 1 case of Q fever was discovered during the investigation; the patient was a girl aged 11 who had been admitted to hospital with a diagnosis of typhoid fever, and Q fever antibody was found in a titre of 320 on the 23rd day of illness.

D. J. Bauer

ZEITLENOK, N. A. & PILLE, E. R. [Detection of Cases of Q Fever and Reservoir of Infection in the Altai Province] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*. Moscow. 1956, No. 7, 17-22. [19 refs.] [In Russian.]

During an epidemiological investigation of the incidence of virus and rickettsial infections carried out in the Altai province in 1954 an examination of case histories of patients in the hospital at Kosh-Agach showed

that 4 were suffering from a febrile illness resembling Q fever, and in complement-fixation tests 3 were found to have Q fever antibody in titres of 10 or 20. Antibody was also present in the sera of 3 of 8 yaks, 3 of 16 kailyks (ox-yak hybrids), 7 of 25 cows, 8 of 25 sheep and 1 of 2 horses from the same area.

D. J. Bauer

BLANC, G. & BRUNEAU, J. Isolement du virus de Q Fever de deux rongeurs sauvages provenant de la forêt de Nefifik (Maroc). [Isolation of *Rickettsia burneti* from Two Species of Rodents in the Nefifik Forest, Morocco] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 431-4, 2 figs.

The authors have previously incriminated wild rabbits as being naturally infected with *Rickettsia burneti* [this *Bulletin*, 1955, v. 52, 965]. They have now pursued their studies in the Nefifik forest near Casablanca. They list 6 species of wild rodents captured in thickets or under rocks, and 3 species were found in rabbit burrows where they seem to have established themselves. These were *Mus spretus*, *Apodemus sylvaticus* and, rarely, *Dipodillus campestris*.

From a batch of 18 *A. sylvaticus* (13 captured in rabbit burrows) they have isolated a strain of *R. burneti*. Another strain was isolated from 8 *Lemniscomys barbarus* captured away from burrows.

The only point of special interest about these 2 strains is that the febrile course was prolonged during the first passage made in experimental guineapigs, probably because the number of organisms had been reduced as a result of the prolonged infection in the wild rodents. After the first passage in guineapigs, the febrile response took the usual course.

H. J. O'D. Burke-Gaffney

ZUBKOVA, R. I., FEDOROVA, N. I. & KALMYKOV, N. L. [Mass Vaccination against Q Fever. I. Reactions and Immunity produced by the Vaccine] *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*. Moscow. 1956, No. 7, 24-7. [In Russian.]

The authors have carried out a mass trial of a Q fever vaccine produced in eggs and inactivated with formaldehyde; the material contained 16 million particles per cc. and was given subcutaneously in doses of 0.25, 0.5 and 1 cc. with intervals of a week. In a preliminary trial 34 of 36 persons developed complement-fixing antibody in titres of 5-320. Investigation of 2,310 inhabitants of the Kirghiz province of the U.S.S.R. showed that 542 (23.5 per cent.) possessed Q fever antibody in titres ranging from 5 to 5,120; persons who had no antibody were treated with the vaccine in the summer of 1955, and 1,128 received the full course of 3 injections. Reactions occurred in 39.1 per cent. after the first injection, and in 62.6 and 51.3 per cent. after the second and third injections; the commonest manifestations were fever, headache, muscle pains, malaise, and erythema

and induration up to 6 cm. in diameter at the site of injection. Antibody titres of 5-640 were found in 215 (73 per cent.) of 294 persons investigated 5 months after the end of vaccination.

D. J. Bauer

ROGER, F., GIROUD, P., LE GAC, P. & ROGER, Annie. Démonstration expérimentale des exanthèmes à *Rickettsia burneti*. [Experimental Demonstration of Exanthemata due to *Rickettsia burneti*] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 423-9.

Intradermal inoculation of rabbits with doses of about 240 complement-fixing units [*unités fixantes*] per kgm. of *Rickettsia burneti* caused pyrexia beginning about the 3rd day and lasting from 5 to 7 days. In addition to pyrexia, an exanthem could be produced regularly in the Burgundy rabbit by inoculating the rickettsial dose in fractions into separate areas of skin; reduction of the number of inoculated areas tended to give a maculo-papular reaction, while increasing it gave a scarlatiniform reaction. These exanthemata resembled eruptions seen in man which were attributed to cutaneous inoculation of *R. burneti* by *Culicoides* [this *Bulletin*, 1954, v. 51, 901]. Possible mechanisms for the production of the exanthemata are discussed.

R. S. F. Hennessy

BARTONELLOSIS

CUADRA C., M. **Salmonellosis Complication in Human Bartonellosis.** *Texas Reports on Biol. & Med.* 1956, v. 14, No. 2, 97-113, 3 figs. [39 refs.]

In a review of the relevant literature the author, professor of medicine at Lima, Peru, shows that it has long been known that a secondary infection with *Salmonella* organisms frequently complicates the Oroya fever stage of human bartonellosis, and that this complication is associated with a very high mortality. The prognosis in uncomplicated Oroya fever, on the other hand, is good. Other intercurrent disorders said to contribute to the high mortality of the disease include tuberculosis, dysentery, malaria, and typhoid, and pneumococcal, *Bact. coli*, and other bacterial infections.

In human bartonellosis there commonly are 2 stages; the first is the haemolytic febrile anaemia—or the Oroya fever—stage; the second the verrucous stage. The latter in some cases may appear without obvious antecedent Oroya fever. The febrile acute anaemic stage is of short duration; it can be divided into a period of red cell destruction and a period of red cell regeneration. Its severity is less than that seen in murine bartonellosis and, unlike the latter, it is not associated with

haemoglobinuria. A chronic form of this stage in man, as opposed to murines, is exceptional and relapse in man also is rare.

A complicating *Salmonella* infection occurring during the febrile anaemic stage of bartonellosis may take place (a) "inside" the stage, both *Bartonella* and *Salmonella* infections coexisting in the blood, (b) during the first week of convalescence ("intermediate" type) or (c) long afterwards (in a recorded case 40 days) ("late" type). Of 13 Peruvian patients with complicating *Salmonella* infections, ranging in age from 15 to 42 years, 3 were "inside" type cases; all but one of the remainder were "intermediate" type cases. The red cell count in these 13 patients during the acute bartonellosis was from 1.5 to 3.0 million; in 10 of them 80 per cent. of the red cells were parasitized. The chief manifestations of a *Salmonella* infection in bartonellosis are sudden fever, digestive disturbances and prostration. Salmonellosis during acute bartonellosis is a very grave complication and usually fatal; death occurs sometimes on the second day, usually on the seventh day, and rarely later than the tenth day. The apathy and stupor characteristic of typhoid are rarely seen; there are generalized pains, especially in the abdomen, with nausea and vomiting, and delirium going on to coma before death. The condition resembles a disease intermediate between intestinal *Salmonella* food-poisoning and the typhoid syndrome. *Salmonella* organisms are easily isolated from the blood during its course.

The *Salmonella* complication reduces the reticulocytes, and as a result the red cell count and haemoglobin level fall still further when it develops during the acute stage of blood destruction; they fail to rise and even fall when it occurs when red cell regeneration should be taking place. In most cases of acute bartonellosis the leucocyte count is normal; less often there is a leucopenia. During the *Salmonella* complication the total leucocyte count usually is not grossly altered; there tends to be a neutrophilia, and this is followed by a lymphocytosis (50 to 60 per cent.) if the patient survives the infection.

The mortality directly due to Oroya fever has always been thought to be high; in the author's view this is not so. In his experience the high mortality is solely due to a secondary *Salmonella* infection; the other reported secondary complicating infections he believes to be rare and of no practical importance. Many writers have described tissue lesions due to bartonellosis and it is to these that they have attributed death; but they did not exclude the presence of a secondary infection in these cases. In fact there are no specific histological lesions in bartonellosis; therefore the accepted pathological picture should be revised. The only means of post-mortem diagnosis of bartonellosis is bacteriological.

Salmonella typhimurium is the most common *Salmonella* invader. The level of life and sanitation in the Sierra villages, where bartonellosis occurs, is extremely low; the inhabitants dwell in promiscuous contact with animals. All of them acquire *Salmonella* infections, chiefly of animal origin; those children who survive them acquire an immunity

against these organisms. When they get bartonellosis, however, their immunity vanishes. In the author's opinion the relationship of *Salmonella* to bartonellosis is comparable to that of *Proteus* to exanthematic typhus; but a *Proteus* infection is not pathogenic to the same degree as is a *Salmonella* infection. He believes that patients with bartonellosis are peculiarly sensitive solely to *Salmonella* infections, and not to other infections. Exanthematic typhus, which also is common in the Sierra of Peru, is not complicated by salmonellosis.

There is no evidence that the course of the bartonellosis itself is influenced by any antibiotic treatment. Of 8 patients with a complicating salmonellosis treated by the author with chloramphenicol all survived; of 5 similar patients not so treated all died. Of 57 patients with *Salmonella* complication described by sundry authors, and not so treated, 52 died—a mortality of 91.22 per cent. Chloramphenicol is the most suitable antibiotic for the treatment of *Salmonella* infections; therefore it is the most suitable drug for the treatment of acute bartonellosis to prevent death from the associated *Salmonella* infection if it is present, or to prevent its establishment if it has not already taken place. The acute anaemia of bartonellosis can be controlled by blood transfusions until the antibody level rises sufficiently to control the *Bartonella* infection.

A. R. D. Adams

WIGAND, R. Serologische Reaktionen an *Haemobartonella muris* und *Eperythrozoon coccoides*. [Serological Reactions with *H. muris* and *E. coccoides*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 322-40, 6 figs. [Numerous refs.]

WIGAND, R. Neuere Untersuchungen über *Haemobartonella muris* Mayer. 3. Mitteilung. [Recent Work on *H. muris*; Part 3] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 316-21. [15 refs.]

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

DE RODANICHE, Enid. Survey of Mosquitoes captured in Honduras for Yellow Fever Virus. *Amer. J. Trop. Med. & Hyg.* 1956, May, v. 5, No. 3, 480-82.

In an attempt to find the vector of yellow fever in Honduras, where an epizootic in monkeys was reported in 1953-54, the author examined 10,309 mosquitoes of various genera and species which had been caught in the affected area, identified in the living state, pooled by species or species groups, frozen and sent to the Gorgas Memorial Laboratory at

Panama. There they were triturated and inoculated intracerebrally into Swiss white mice.

The results were negative in that no yellow fever virus was found, but from one group of *Psorophora* species an unidentified neurotropic virus was isolated (referred to as *Psorophora* virus) and has been maintained for 15 passages in mice. It is not a strain of yellow fever virus and is probably not a spontaneous virus of the mice themselves. Further work on it is in progress.

Charles Wilcocks

GILKES, C. D., KELLETT, F. R. S. & GILLETT, H. P. S. **Yellow Fever in Trinidad and the Development of Resistance in *Aedes aegypti* Linn, to D.D.T. Formulations.** *West Indian Med. J.* 1956, June, v. 5, No. 2, 73-89, 6 figs. [13 refs.]

After the 1913 outbreak of yellow fever in Trinidad, it was thought that the disease had disappeared from the Island. In 1953 the Trinidad Regional Virus Laboratory took blood samples from some of the inhabitants. A number of these neutralized yellow fever virus, showing that the disease was still present but in a latent form. Undoubted cases of yellow fever were reported in 1954.

It was noticed then that *Aedes aegypti* were extremely prevalent in Trinidad and steps were taken to eradicate the mosquito from the Island. DDT suspensions were used as larvicides. It was soon evident that total mortality was not to be achieved by the dosages recommended. It was feared that resistance to DDT had developed in the *Aedes aegypti* in Trinidad.

A series of laboratory tests were made with DDT wettable powder in suspensions and emulsions. With the suspensions dosages as high as 500 p.p.m. failed to give complete mortality after a 24-hour exposure. With DDT emulsions (DDT + xylene + Antarox) over 99 per cent. mortality was achieved with 20 p.p.m. of DDT. Comparable tests were made with BHC and dieldrin. With BHC suspensions 1 p.p.m. gave 93.7 per cent. kill; the emulsion at 1 p.p.m. gave 91.9 per cent. kill. Dieldrin suspensions at 1 p.p.m. gave only 70.3 per cent. kill. In view of the low dosage required with BHC, it is suggested that this insecticide should replace DDT as larvicide against the *Aedes aegypti* in Trinidad. [For previous references to yellow fever in Trinidad, see this *Bulletin*, 1956, v. 53, 1333.]

W. Z. Coker

PANTHIER, R. A propos de quelques cas de réactions nerveuses tardives observées chez des nourrissons après vaccination antiamarile (17 D).

[**A Few Cases of Delayed Nervous Reactions observed in Infants after Vaccination against Yellow Fever (17 D)**] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 477-94. [22 refs.]

This article records the occurrence of 7 cases of meningo-encephalitis associated with the administration, between 1952 and 1955, of 17D

vaccine prepared at the Pasteur Institute, Paris, to infants less than one year old. For reasons connected with their suggested aetiology the cases are arranged in 3 groups.

The one case in group I was in a 4-weeks-old baby boy who, after having been merely pricked with a needle dipped in the vaccine suspension and having received, therefore, only a minute quantity of virus, developed on the 11th post-vaccination day a series of convulsive attacks over a 48-hour period; recovery was complete and uneventful; on the 13th post-vaccination day the serum was found to contain no detectable antibody. As to the aetiology of this case, "*sûrement imputable à l'acte vaccinal*", it is held that the very low dosage of vaccine virus resulted in tardy immunization and that involvement of the central nervous system occurred before antibodies developed. The case was, therefore, one of "viraemia without antibody" [the basis of the low dose theory of causation].

The 3 cases comprising group II were associated with the inoculation of a normal dose of vaccine subculture presenting a "variation". One case occurred in a 3-months-old baby girl, who on the 10th post-vaccination day, was admitted to hospital with high temperature (40°C.) and intermittent spasmoid muscular contractions; the cerebrospinal fluid contained 152 cells per cmm. (lymphocytes 86 per cent.); temperature returned to normal in 6 days and thereafter recovery was rapid and without any nervous sequelae; neutralization tests carried out on the 16th and 27th post-vaccination days showed incomplete protection against 25 LD50 and complete protection against 100 LD50, respectively. Two cases were observed in baby boys aged, respectively, 5 weeks and 6 months; nervous reactions similar to those in the 2 cases instanced above began on the 12th and 11th post-vaccination days and lasted 5 days and 48 hours, respectively; sero-protection tests were not performed. These 3 cases, then, were related to vaccine prepared during an emergency from an inoculum removed by a few passes from the "seed"; moreover, at that time the eggs used for vaccine production had not been incubated at the optimum temperature (37.5°C.) for cultivation of the virus. Hypersensitivity to the prophylactic in infants under one year of age—a hypersensitivity not shared by adults—contributed a further aetiological factor in the 4 cases mentioned above.

The 3 cases in group III differed from those already mentioned in that the period between vaccination and the onset of nervous symptoms was much longer (18 to 26 days) and that protective antibodies, invariably present at about the time of onset, rapidly rose thereafter to a high level. One case, in 1952, was in a 6-months-old African baby girl who, on the 18th post-vaccination day, developed convulsive seizures and a temporary hemiplegia, with electro-encephalographic findings of a localized meningo-encephalitis; a sero-protection test on the 20th day already revealed a satisfactory antibody response—complete protection against more than 100 LD50. For the vaccination of this case the

inoculum had derived from a 17D substrain in which a "variation" had occurred. The second case was in 1954 in a 4-months-old African girl who, 26 days after vaccination, showed nervous symptoms—convulsive attacks, which continued thereafter for 5 days; sero-protection tests on the 29th and 33rd days revealed complete protection against 250 LD₅₀ and 2,500 LD₅₀, respectively. In this, as in the next case, the vaccine used conformed in every respect to official standards. The third case was in 1955 in a 10-months-old baby boy, who on the 24th post-vaccination day showed meningitic signs, with marked changes in the cerebrospinal fluid; sero-protection tests on the 30th and 60th days revealed protection against less than, and more than 100 LD₅₀, respectively. Doubt is expressed regarding the aetiology of these 3 cases, mainly because they do not fit into the picture of "viraemia in the absence of antibodies" and because of their abnormally protracted incubation periods.

The author concludes by advocating the non-vaccination of infants under one year of age and the establishment of an official centre for preparing "seed" vaccine and supplying it to all laboratories which make yellow fever vaccine—the "seed" to be used only during the period of its optimum activity (2–3 years). [The first 5 cases mentioned in this paper had previously been reported by LÉPINE and cited by STUART (*World Health Organization Monograph Series No. 30*, 1956, p. 143; this *Bulletin*, 1956, v. 53, 872). In the single case in group I there is no specific evidence that the encephalitis from which the infant suffered resulted from the action of neurotropic yellow fever virus. The cases in group II emphasize the necessity for scrupulous care in following exactly the prescribed technique for preparing vaccine. The lengthy incubation periods exemplified in group III do not argue in favour of an aetiology different from that seen in cases with the more usual periods of 11–12 days. Thus, while the average in 199 cases reported by FOX *et al.* [*ibid.*, 1943, v. 40, 44] was 12.7 days, 6 per cent. had nervous symptoms more than 24 days after vaccination.]

G. Stuart

DENGUE AND ALLIED FEVERS

SMITH, C. E. G. *The History of Dengue in Tropical Asia and its Probable Relationship to the Mosquito Aedes aegypti.* *J. Trop. Med. & Hyg.* 1956, Oct., v. 59, No. 10, 243–51, 2 figs. [59 refs.]

The author notes that in Malaya infection with dengue, or a closely related virus, has been found in a considerable proportion of animals living in forest trees but in very few ground-dwelling forest animals. He postulates therefore that there is a reservoir of dengue in the forests maintained by mosquitoes which do not bite at ground level. From this reservoir dengue is propagated by *Aedes (Stegomyia) albopictus* among the

rural human population and is found there only as an endemic disease. A recent survey gave the following figures for neutralizing antibodies to dengue-1 virus in the sera of rural Malayans: below the age of 11 years, 25 per cent. positive; at ages of 11 to 20 years, 50 per cent. positive; over 30 years of age, almost 100 per cent. positive. (Antibodies to dengue-2 virus were also present in some cases but it is uncertain as yet if this is to be accepted as proof of the presence of dengue-2 virus, for there is the possibility of serological cross-reactions.)

A. (S.) aegypti is the common vector in the towns. Until the end of the 19th century epidemics of dengue occurred in the towns but not in rural districts. It is presumed that the virus was introduced from rural areas to newly-arrived *A. (S.) aegypti* and thus epidemics occurred among susceptible populations. When *A. (S.) aegypti* became firmly established, conditions then prevailed to maintain the infection in urban areas and hence dengue became endemic with localized outbreaks from time to time only in susceptible immigrants.

The scanty records of mosquito catches in the more distant past tend to support this theory and similar conditions may be presumed to have occurred throughout tropical Asia. Dengue in India and in Indo China are discussed in relation to the literature. [See also this *Bulletin*, 1957, v. 54, 25.]

Frederick J. Wright

RABIES

BALTAZARD, M. Le traitement antirabique. Réflexions sur quelques expériences récentes. [Antirabies Treatment. Consideration of Some Recent Experimental Work] *Rev. d'Immunologie*. 1956, July-Sept., v. 20, No. 4, 207-14.

In Iran the failure of vaccine treatment to prevent a high case-fatality rate among persons bitten on the head by rabid wolves led in 1949 to intensive research at the Pasteur Institute, Teheran, with the object of ameliorating a situation described as catastrophic. Some of the opinions formed as a result of such research at Teheran and elsewhere are expressed in the present article.

The value of the vaccine prepared at Teheran is first considered—a vaccine consisting of a 5 per cent. suspension of fixed-virus-infected sheep brain in 0.6 per cent. phenol, "inactivated" at 37°C. for 24 hours and thereafter kept at 4°C. until taken into use. In this connexion the phenomenon of inactivation is discussed, as well as the difficulty experienced in achieving the desired degree of virus inactivation in the vaccine, i.e., eliminating the pathogenic and at the same time retaining the antigenic properties of the virus. In the case of phenolized vaccines the antigenic potency, which is considerably lowered by exposure to 37°C.,

continues (when the vaccine is stored at 4°C.) progressively to decline until after a time, difficult to determine with accuracy, it disappears altogether. Because of this instability of phenolized vaccine, it is the rule in Teheran to prepare at one time only comparatively small vaccine lots and never to use vaccine more than 3 months after its date of manufacture; such vaccine, when subjected to a modified Habel test for potency, invariably meets, and mostly exceeds, the standard minimum requirements. Because of the difficulty in keeping vaccine at 4°C. during transportation, decentralization of treatment with phenolized vaccine is not recommended.

Whether other types of vaccine could better meet the needs for production in bulk and decentralization of treatment is the next question raised. Lyophilized irradiated vaccine, for example, with a reputed ability to maintain its potency indefinitely, would seem the obvious choice. Samples received from a firm specializing in the production of this type of vaccine proved, however, to have lost all immunizing power less than 7 months after the date of manufacture.

Finally the author, after referring to recently published work on the serological response in individuals during and after various forms of anti-rabies treatment, considers whether the level of antibody in a treated patient's blood is, in fact, evidence of protection against rabies infection. In this connexion he analyses the results obtained from the sera of 5 persons who, after having been bitten on the head by a rabid wolf, each received a 21-day course of 5 per cent. Semple-type vaccine [this *Bulletin*, 1956, v. 53, 434, 435]. From these results he considers the quantitative determination of antibodies as evidence of resistance to the rabies virus to be a less and less defensible test: street virus can clearly develop in individuals whose sera show a high antibody content; moreover that a solid resistance to the virus can exist in the absence of antibody has frequently been observed in animals. That vaccine prepared from the avirulent Flury strain should not be used for human immunization just because it fails to evoke antibody response in man can hardly, therefore, be justified. [Although failure to evoke antibody response in man with one intramuscular injection of Flury strain vaccine has been reported (ATANASIU *et al.*, this *Bulletin*, 1956, v. 53, 1420), success has been achieved when two or more intramuscular or intradermal inoculations were given at spaced intervals (SCHWAB *et al.*, *ibid.*, 1954, v. 51, 1240, and FOX *et al.*, *Calif. Vet.*, 1955, v. 8, No. 7, 20).]

G. Stuart

CONSTANTINESCU, N., ȘTIRBU, A., CEPTEA, A. & TAINDEL, C. Influența schemei de tratament în vaccinarea antirabică înainte și după infecție. [The Effect of Treatment Schedule in Rabies Vaccination before and after Infection] Studii și Cercetări Inframicrobiol., Microbiol. și Parazitol. 1955, July-Dec., v. 6, Nos. 3/4, 375-87. [17 refs.] French summary.

In experiments with dogs, rabbits, guineapigs, rats and mice, in which 622 animals were used, rabies vaccine of Fermi type conferred no protection when given subcutaneously or intradermally in daily doses of 1 cc. after intramuscular or intracerebral infection with fixed and street strains of rabies virus. Further experiments were carried out with 101 mice in which Fermi vaccine was administered intraperitoneally according to 3 different schedules, followed by intracerebral challenge with 200-300 LD₅₀ of fixed virus after 2-17 days. The greatest degree of protection (52 per cent. survival) was obtained with 6 doses of 0.025 cc. given at intervals of 2 days, and the least (29 per cent. survival) with 7 daily doses of 0.1 cc.; similar results were obtained in experiments with 268 rats, and the authors conclude that the intensive method of administering rabies vaccine is less effective in producing immunity, and may have unfavourable influence on the outcome when used in treatment.

D. J. Bauer

NOVI SAD. Annual Report of the Pasteur Institute in Novi Sad, for 1954. 49 pp. 1955. [In Serbian, with English Introduction.]

The Novi Sad strain of fixed rabies virus had undergone 712 passages in rabbit brain in the Pasteur Institute in Novi Sad, Yugoslavia, by the end of 1954. Pieces of brain and spinal cord of sheep infected with the virus are put in ether for 4 days and then stored in 33 per cent. glycerol and 1 per cent. phenol for up to 2 years. A 1 in 11 suspension in 1 per cent. phenol is used as vaccine, and is given in 3 or 6 daily doses of 5 cc. according to the severity of the bite. In 1954, the year covered by the report, 14,294 persons in Yugoslavia were treated with the vaccine, and 7 (0.04 per cent.) died from rabies; during the same period 17 untreated persons developed rabies. There was 1 paralytic accident which ended in recovery. Between 1927 and 1954, excluding the war years, 273,333 persons were treated with the vaccine in Yugoslavia, 281 died from rabies (0.10 per cent.), and 339 cases of rabies occurred in unvaccinated persons; there were 24 paralytic accidents (0.008 per cent.), with 4 deaths. The incubation period of rabies ranged from 12 to 1,024 days.

The Institute has produced a modified vaccine with the object of increasing immunity and reducing the incidence of paralytic accidents. The vaccine is made from brain only; after 45 days in phenol-glycerol the pieces of brain are put in 0.1 per cent. formaldehyde for 48 hours and then ground in 0.5 per cent. phenol to make a 1 in 11 suspension. One injection of 10 cc. is given for superficial wounds, and 3 daily injections for deep wounds. In 1954 1,000 persons were treated by this modified method; there were no deaths and no paralytic accidents. The report is provided with statistical tables, and 25 case histories are also given.

D. J. Bauer

PLAQUE

BRYGOO, E. R. Le diagnostic de la peste par inoculation à la souris de produits pathologiques additionnés de pénicilline. [Diagnosis of Plague by Inoculation of Mice with Pathological Material mixed with Penicillin] *Bull. Soc. Path. Exot.* 1956, May–June, v. 49, No. 3, 409–14. [10 refs.]

Intraperitoneal inoculation of mice with plague-suspect material mixed with penicillin (1,000 units) gave more isolations of *Pasteurella pestis* than were obtained by percutaneous inoculation of guineapigs. Thus, the plague bacillus was recovered from 2 out of 25 specimens by guineapig inoculation and from 7 of the same specimens by mouse inoculation. Mice showed a more rapid response and greater sensitivity to *P. pestis*, but it was noted that in one case where a guineapig yielded a positive culture 3 mice inoculated with the same material together with penicillin died of *Proteus* infection within 24 hours. *R. S. F. Hennessey*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

ELSDON-DEW, R. Further Aspects of Amoebiasis in Africans. *Central African J. of Med.* 1956, Aug., v. 2, No. 8, 291–4. [21 refs.]

Continuing the series of observations initially recorded in 1946 [this *Bulletin*, 1947, v. 44, 310] the author broadly reviews the work of the Amoebiasis Research Unit in Durban over the intervening 10 years, and elaborates some general conclusions at which he has arrived as a result of his experience. The paper does not lend itself to summary and it should be consulted in the original. *A. R. D. Adams*

McCONNACHIE, Elspeth W. Modification and Elimination of the Bacterial Flora in Cultures of *Entamoeba invadens* Rodhain, 1934. *Parasitology*. 1956, May, v. 46, Nos. 1/2, 117–29. [22 refs.]

The study of the cultural requirements—and ultimately of the physiology—of *Entamoeba histolytica* has been hampered by its dependence on associated bacteria; therefore precise information on the growth factors and metabolism of this amoeba will only be obtained when it is grown in the absence of any micro-organisms, in axenic cultures. As the closely related reptilian parasite, *E. invadens*, provides more suitable

material for the study of these problems, it was used by the author to obtain strains in which the accompanying flora was progressively simplified and finally eliminated.

At first, attempts were made to produce monobacterial strains of *E. invadens* by treating washed cysts, from cultures containing a mixed flora, with N/10 HCl, and (after neutralization with NaCO₃ and washing) inoculating them into medium seeded with *Bacterium coli*. This treatment eliminated part of the flora, which was further simplified by treatment successively with 0.002 per cent. HgCl₂ (45 min.), 0.02 per cent. KMnO₄ (15 min.) and 0.02 per cent. acriflavine (20 hours). After washing, suspensions of the cysts in Ringer's solution were inoculated into culture media seeded with the desired species of bacteria (*Bacterium coli* or *Bacillus megatherium*). This chemical treatment resulted in the production of 5 strains of *E. invadens*, each growing with what appeared to be a single species of bacterium. However, on inoculation of the cultures on bacteriological media, incubated aerobically and anaerobically, the presence of a second coliform bacterium (labelled X) was revealed.

In two of these dibacterial strains organism X was eliminated by growing *E. invadens* in media containing 0.5-1.0 ml. of 0.2 per cent. gentian violet, and subinoculating the cultures daily for 72 days. In this way two monobacterial strains were produced: one with *Bact. coli*, the other with *Staphylococcus albus*, which have been maintained for 24 and 20 months, respectively.

Finally, a strain of *E. invadens* growing without any bacteria was produced from the second monobacterial strain by repeated subinoculation (7 subcultures at intervals of 3-4 days) into tubes of saline containing a slice of sterile chick liver and antibiotics (1,000 units each of penicillin and streptomycin per 1 ml. of medium), and incubated at 24°C. under anaerobic conditions. Subsequent subcultures were made without the addition of antibiotics, while chick liver was replaced by rat liver. The absence of concomitant micro-organisms (bacteria and fungi) in the axenic cultures was determined by test cultures in appropriate media. At the time of writing the axenic strain of *E. invadens* had been maintained in saline-liver culture for over 14 months, by subinoculations every 3 weeks. Growth of the axenic strain of amoebae is relatively poor with rare cyst formation.

The chief value of these cultures is that they provide a source of sterile amoebae for testing the growth-promoting properties of various media, which might eventually lead to the discovery of simplified media for maintaining axenic cultures of *Entamoeba*.

C. A. Hoare

SMEDLEY, S. R. **A Method of Freeing Cultures of *Entamoeba histolytica* from Contamination with *Blastocystis*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 232-3.

The method of eliminating *Blastocystis* from cultures of *Entamoeba histolytica*, described in this paper, is based on the observation [this

Bulletin, 1936, v. 33, 534; 1943, v. 40, 268] that, when faeces containing these organisms are mixed with water, they are both lysed, but the destruction of *Blastocystis* is much more rapid (5 min.) than that of the amoeba, which can be recovered in subculture after such treatment for 2 hours.

The procedure is as follows. "The combined deposits (about 1.3 ml.) from three tubes of 48-hr. *E. histolytica* culture contaminated with *Blastocystis*, are mixed with 12 ml. sterile distilled water in a 4" x 1" tube, and allowed to stand for 20 min. at room temperature. After this time, samples of the deposit are inoculated into fresh tubes of medium, and incubated for 48 hr. at 37°C. Under these conditions a few attenuated *Blastocystis* may be observed in the cultures, but they disappear on the next subculture."

C. A. Hoare

NEAL, R. A. & VINCENT, Patricia. **Strain Variation in *Entamoeba histolytica*. II. The Effect of Serial Liver Passage on the Virulence.** *Parasitology*. 1956, May, v. 46, No. 1/2, 173-82. [12 refs.]

The authors describe experiments on the effect of liver passage upon the virulence of *Entamoeba histolytica*. As rats proved to be unsuitable, hamsters were used for this purpose. About 25,000 amoebae contained in 0.1 ml. of culture fluid were inoculated together with the concomitant bacteria, into the liver, and 5-8 days later the hamsters were killed and amoebic liver abscesses, when present, were examined microscopically and culturally (HSre + S medium). From these cultures further liver passages were made. As the virulence of the concomitant bacteria sometimes increased considerably, in such cases hamsters were immunized by intraperitoneal injections of the appropriate bacterial cultures. The virulence of the liver substrains of amoebae was tested by subinoculating them into the caecum of young rats and assessing the degree of its ulceration.

Detailed experiments were carried out with 3 strains of *E. histolytica*. One strain (*M*), isolated from an acute case of amoebiasis, was invasive for rats for 5 years, after which its virulence declined considerably. This attenuated strain produced liver lesions in half of the animals, but the amoebae recovered in culture from the first liver passage produced only slight caecal ulceration in rats. However, from the fifth passage onwards their virulence increased considerably, producing extensive caecal ulceration in these animals.

The next series of experiments was made with a non-invasive strain (*EA*), isolated more than 18 months previously from a chronic case of amoebiasis. Although 10 liver passages were made through hamsters, the invasiveness of the amoebae remained unaltered, producing only low-grade caecal ulceration in rats. In view of these results the experiment was repeated with a non-invasive strain of amoebae (*JO*) recently isolated from a contact carrier. This strain likewise showed no increase of invasiveness for the caecum of rats after 5 liver passages.

It was thus shown that serial liver passages revived the invasiveness of a strain whose virulence had diminished after cultivation, but failed to increase the invasiveness of avirulent strains. The authors believe that the factor involved in the invasion of the large intestine by *E. histolytica* is naturally present in strains isolated from acute cases of amoebiasis, but is absent in strains from symptomless carriers. Moreover, it was shown that the increase of the virulence of the amoebae is not due to the increase in the virulence of the accompanying bacteria. [For Part I, see this *Bulletin*, 1955, v. 52, 1087.]

C. A. Hoare

NEAL, R. A. Strain Variation in *Entamoeba histolytica*. III. The Influence of the Bacterial Flora on Virulence to Rats. *Parasitology*. 1956, May, v. 46, Nos. 1/2, 183-91. [20 refs.]

Having previously demonstrated that different strains of *Entamoeba histolytica* vary in their invasiveness (or virulence), which is expressed in the absence or presence and degree of caecal ulceration produced by the amoebae in experimental infections of rats, in the present paper the author describes experiments designed to determine whether this variation in virulence might be due to the influence of the flora accompanying the amoebae in culture. For this purpose, the virulence of cultures of strains of *E. histolytica* differing in invasiveness was tested with various combinations of bacterial associates by intracaeal injection of young rats, which were killed 7 days later when the contents of their caecum were examined for amoebae and its walls for degree of ulceration. The bacteria used for the experiments were usually isolated from the amoebic cultures in nutrient broth medium.

Among the strains and substrains of *E. histolytica* used, 5 were known to be invasive and 7 non-invasive. In one experiment bacteria from a virulent amoebic strain (*HN*) were added to 8 subcultures of a non-invasive strain (*STC*), but there was no increase in the virulence of the "additive" strain compared with the original one. Then a cyst-promoting flora was added to the same non-invasive strain and its washed cysts were cultivated with *Bact. coli* and with the floras of 2 virulent strains of amoebae (*M, HN*), but again this substitution failed to increase the virulence of the "synthetic" strain. In another experiment, bacteria from 2 virulent strains (*M, OW*) were added to non-invasive mono- and dixenic strains of amoebae, without any resulting increase of their virulence (one strain even failed to infect rats). In order to determine whether the accompanying bacteria inhibit the virulence of amoebae, amoebae of an invasive strain were washed and inoculated into media with bacteria from (a) non-invasive and (b) invasive strains. However, this treatment failed to change the virulence of the substrains, both of which remained invasive.

After an invasive strain (*M*) became attenuated by prolonged cultivation, attempts were made to revive its virulence by passing it through 5

successive subcultures with the original flora, which had been kept since the time when the amoebae were invasive. A similar experiment was made with another attenuated strain. In neither of these cases was the virulence increased. Washed amoebae from the first attenuated strain (*M*) were then cultivated with the bacteria of its substrain, in which the virulence had been restored by hamster liver passage [see NEAL and VINCENT, above], but there was again no increase in virulence. Finally, to ensure that the bacteria reached the caecum, rats were inoculated intracaeally, first with amoebae from an attenuated strain (*M*) and followed by bacteria from its invasive substrains (reinforced by liver passage), but again no increase of virulence was produced.

It was thus shown that the addition of bacteria from virulent to non-virulent strains of *E. histolytica* does not increase the invasiveness of the non-virulent strains. Likewise, bacteria from substrains, the virulence of which was revived by liver passage, will not increase the invasiveness of the attenuated parent strain. And conversely the floras of non-virulent strains do not reduce the invasiveness of virulent strains. It is concluded that the virulence of a strain of *E. histolytica* depends primarily upon the invasiveness of the amoeba itself.

C. A. Hoare

MÜHLFORDT, H. & MARTINEZ-SILVA, R. Die Wirkung von Isoconessin und Neoconessin im Vergleich zu Conessin und Emetin auf *Entamoeba histolytica* *in vitro*. [Comparison of the *in vitro* Activity of Iso-Conessine and Neo-Conessine with that of Conessine and Emetine on *Entamoeba histolytica*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, June, v. 7, No. 2, 211-19.

Alkaloids of the *Holarrhena* group and especially conessine have long been known as amoebicidal agents. French workers have recommended conessine in the treatment of amoebic dysentery and of amoebic hepatitis, and suggested that it was even more potent than emetine. It suffered from the disadvantage, however, that undesirable nervous symptoms frequently resulted from its use. Salts of the base other than the hydrochloride were used as well as the compounds iso- and neo-conessine as alternatives.

The activity of the two latter substances has now been compared *in vitro* with those of the parent conessine and of emetine. In the tests a culture of *E. histolytica* with mixed bacterial flora was used with the diphasic medium of DOBELL and LAIDLAW [this *Bulletin*, 1927, v. 24, 363]. Examinations of the drug-treated parasite were made at intervals over a period of 14 days, and subculture was resorted to when necessary to see whether the amoebae had survived. The long period of examination was rendered possible by renewing the overlay at 2-day intervals. Details are given in tables of the effects of different concentrations of the drugs on the amoebae when examined at definite intervals. It was found under the

conditions of study that iso-conessine was least active and conessine most active while neo-conessine occupied an intermediate position. Emetine was active at a much greater dilution than the others.

The authors rightly conclude that their *in vitro* results may have no correlation with those obtained *in vivo*. They recognize the undesirability of using a diphasic medium, and of amoebae cultures containing a mixed bacterial flora, but take comfort from the fact that drugs which are active *in vivo* also show *in vitro* activity.

J. D. Fulton

RISTIĆ, L. & BRAJOVIĆ, R. **Contribution to the Study of Allergenical Phenomena in the Amebiasis.** *Acta Med. Jugoslavica.* 1956, v. 10, No. 1, 63-92.

The authors hold the view that the proteolytic action of *Entamoeba histolytica* creates heterogenous proteins, sensitization to which may result in a variety of allergic manifestations. They state that they have found that asthma is far more prevalent in those with amoebiasis than in the uninfected. In cases of chronic urticaria this infestation also is common.

A. R. D. Adams

DE VRIES, A., KESSLER, J., LEHMANN, E. E. & RABINOVICI, N. **Liver Amebiasis with Four Case Reports.** *Acta Med. Orientalia.* 1956, Apr., v. 15, No. 4, 97-118, 4 figs. [26 refs.]

Hospital case records between 1945 and 1953 of 53 patients in Israel with hepatic amoebiasis have been analysed. It is considered that 24 of these patients suffered from amoebic "hepatitis" and 29 from amoebic "liver abscess". The histories and some clinical data relative to these patients are set out in a table. [From this it would appear that in only 7 of the 53 was there a diagnosis of intestinal amoebiasis, and from only 4 of the total were parasites recovered in the stools.] Male (42) greatly exceeded female (11) patients; most of them were between 25 and 50 years of age. In further tables the physical, X-ray, and laboratory finds are elaborated; in others are set out the treatment and complications, and also the erroneous diagnoses preceding those finally accepted.

A few detailed case reports are given to illustrate the difficulties in the diagnosis of hepatic amoebiasis, which in these cases was made only after a response to specific treatment with emetine or chloroquine. The authors [appropriately] end their paper with the statement that "the diagnosis in the majority of non-surgical forms of liver amebiasis remains an assumption".

A. R. D. Adams

See also p. 233, JUNG & FAUST, **The Treatment of Intestinal Parasitic Infections.**

SCHAIBLE, G. Die Behandlung der Amoebendysenterie und ihrer Folgezustände mit Resotren comp. [Treatment of Amoebic Dysentery with Resotren Compound] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 285-9.

The first experiences by the author in Indonesia were gained with a combination of emetine with chloroquine (or resochin) in a series of 34 patients with amoebic hepatitis and 30 with liver abscess. Successful results were obtained in 91 per cent. but there were 3 relapses within a 3-month period.

In order to simplify the process, Resotren (Bayer) was produced [this *Bulletin*, 1954, v. 51, 586, 924, 925] and in this there is a combination of resochin base with iodoxyquinoline sulphonic acid. Experimental treatment was continued on this basis and at the same time emetine injections were discontinued on account of toxicity.

Resotren was used in 35 patients (24 cases of amoebic hepatitis and 11 of liver abscess) and the results were impressive. However, it appeared to cause an intractable diarrhoea in 17 (49 per cent.). It was shown that this complication was attributable to the quinoline sulphonic acid. The firm of Bayer thereupon produced a modification known as Resotren compound by reducing the amount of quinoline sulphonic acid and adding non-sulphonated di-iodohydroxyquinoline. This compound gave excellent results in 19 patients (liver abscess 5, amoebic hepatitis 10, acute amoebic dysentery 4). In a few cases this drug produced acute diarrhoea.

The drug is given in tablet form, but the dose of each is not stated; apparently the normal procedure is 4 tablets daily for the first week, 3 tablets daily in the second week, and thereafter, if required, 2 tablets daily for 2 weeks in an adult of average size. In some cases larger doses are required; in one the total dosage was 86 tablets.

Philip Manson-Bahr

LOUGHIN, E. H. & MULLIN, W. G. Combined Therapy of Amebiasis with Diiodohydroxyquinoline, Chloroquine, Bacitracin, and Neomycin. *Antibiotic Med.* New York. 1956, July, v. 3, No. 2, 120-5. [39 refs.]

The authors review and comment on a lengthy list of amoebicides advocated since the introduction of emetine-bismuth-iodide 40 years ago. These have waxed and waned in popularity; most of them on more extensive use have failed to live up to the initially large claims made for them as amoebicides; some of them have been found to produce disturbing toxic side-effects. The combined therapy of amoebiasis is not new, but the drugs used in it have generally been given in full doses. Little attention has been paid to the simultaneous administration of drugs and antibiotics given in partial dosage to enhance their synergistic action.

The authors have treated 30 patients suffering from chronic intestinal

amoebiasis with a combined course of diiodohydroxyquinoline, chloroquine, bacitracin and neomycin administered in the same tablet [Diodotracin]. The dose of the first drug contained in each tablet is 350 mgm., of the second 50 mgm., of the third 1,000 units, and of the last 4,000 units. For children under 5 years of age the dosage was 1 tablet twice daily; that between 5 and 10 years was 1 tablet thrice daily; and that above that age and for adults was 2 tablets thrice daily; the course in each case extended over 10 days. Apparently all of the 30 patients were sterilized of their intestinal *Entamoeba histolytica* infections by this treatment, as judged by weekly stool examinations for 6 weeks after treatment. Some few patients supplied stool specimens for much longer periods, and these also remained free from parasites. All of the 5 patients who had visible ulcerative lesions in the lowermost bowel were freed of these by the treatment. No evidence of toxicity was discerned as a result of the treatment. The authors conclude that not only is this treatment singularly effective, but it could safely be tested in mass treatment. [It is to be hoped that these forecasts will prove to be more enduring than some of those that the authors, very rightly, themselves criticize.]

A. R. D. Adams

SHAFEI, A. Z. **The Treatment of Amebic Dysentery with Streptomycin-Polymyxin-Neomycin-Bacitracin Combination.** *Antibiotic Med.* New York. 1956, Mar., v. 2, No. 3, 158-65. [15 refs.]

After a brief summary of various reports by sundry authors on the action of antibiotics in the treatment of intestinal amoebiasis, the author records the results of his own treatment of 30 patients with a mixture of 4 antibiotics given in combination. This combination is marketed under the trade name Poli-Sinerge (Atral Laboratories, Portugal). Data concerning the treatment of the 30 patients are set out in tables; 9 of them suffered from acute amoebic dysentery, the rest had a history of dysenteric relapses over a period of years. The diagnosis of amoebiasis in each case was established parasitologically. After the course of treatment stools were examined weekly, and then twice monthly for 4 months; in some cases monthly examinations were continued for another 3 months. "Cure" apparently means the disappearance of the parasites as judged by these examinations.

The author finishes with the following conclusions:—

"During an observation period extending four to seven months, polymyxin B-dihydrostreptomycin-neomycin-bacitracin combination was found to possess high antiamebic action in intestinal amebiasis.

"When given in a dose of 800,000 units of polymyxin, 20,000 units of bacitracin, 1400 mg. of neomycin, and 1200 mg. of dihydrostreptomycin daily for five days, the combination cured 70 per cent of cases.

"When the dose was halved but continued for 10 days (same total dose), the rate of cure was raised to 80 per cent.

" When the former course was given for five days and the daily dose was halved and continued for another five days, the rate of cure was raised further to 90 per cent, and the relapse in this latter group was limited to detection of cysts in sigmoidoscopically aspirated material collected four months after treatment was stopped.

" No side reactions of any significance occurred in any of the groups included in these series, except in 1 case that showed clinical evidence of B-complex avitaminosis.

" The blood picture, liver function tests, and kidney function tests were not affected."

A. R. D. Adams

ECHEVERRIA ALVAREZ, E. & LEON MORENO, A. **Puromycin and Puromycin-Tetracycline in Amebiasis.** *Antibiotic Med.* New York. 1956, May, v. 2, No. 5, 327-31. [10 refs.]

Puromycin [now Stylomycin] was used in Mexico for the treatment of 16 patients with intestinal amoebiasis; a combination of puromycin and tetracycline was used for the treatment of another 12. The dosage of puromycin [by mouth] where given alone was 10 mgm./kgm. body weight daily, in 3 divided doses, for 5 days; that of tetracycline was 250 mgm. every 4 hours for 5 days, and when puromycin was given with it the dosage of the latter also was 250 mgm. every 4 hours for 5 days, irrespective of the patient's body weight. There were no toxic side effects from either treatment. Of the 16 patients treated with puromycin alone 12 were passing cysts alone, and all these were "cured"; the 4 patients passing amoebae were not "cured" by puromycin alone. Of the 12 treated with the antibiotics given together all were "cured". Three patients among them with amoebic liver abscesses had to undergo surgical drainage of the abscesses; from the statements in the text and the data in the tables it is to be inferred that they were cured by this surgical interference in conjunction with the double antibiotic treatment.

[The word "cure" is not clearly defined, and the criteria on which it is based are not specifically stated.]

A. R. D. Adams

YAWS AND OTHER TREPONEMATOSES

KLOKKE, A. H. **Yaws in the Households of Tjaws (Central Java).**

An Epidemiologic Study from the Treponematoses Control Program in Indonesia. [Thesis.] pp. xvii + 192, 6 maps (1 folding), 5 diagrams & 18 graphs. [Numerous refs.] Surabaja: Pertjetakan R.T. d/h H.v.I.

The author presents the results of an intensive study and statistical analysis of yaws in the subdistrict of Tjaws, Central Java, which has a

population of 40,000 and provided 7,000 patients in 4 surveys carried out during a period of 2 years. This information was supplemented by investigations made in one of the villages, Barepan, where nearly all the 2,543 inhabitants were examined clinically and serologically during the 4th survey.

The author pleads for a dynamic classification of yaws which permits the recognition of more combinations of lesions than that advocated by WHO. He advocates the following:—

for epidemiological use

														Code
(a)	infectious	yaws	...	...	...	...	...	...	...	...	...	...	...	I
(b)	non-infectious	yaws	...	...	...	...	...	...	...	...	...	...	...	NI
(c)	non-yaws	...	...	...	...	...	...	...	...	...	...	...	...	NY

for clinical use

(a)	early	lesions	E
(b)	"	"	combined	with	"keratoderma"	...	...	...	...	...	...	...	...	EK
(c)	"	"	combined	with	bone	and	other	late	lesions	...	...	...	...	EO
(d)	non-ulcerative	palmar	&	plantar	lesions	"keratoderma"	...	...	...	...	...	...	...	K
(e)	bone	and	joint	lesions	...	...	...	...	...	...	...	...	...	B
(f)	late	ulcerative	lesions	...	...	...	...	...	...	...	...	...	...	U
(g)	bone	lesions	combined	with	late	ulcerative	lesions	...	...	...	...	...	...	BU

The author criticizes the term latent yaws. Serological tests may be positive shortly after treatment in cured yaws. Relapses in yaws are possibly due to re-infection, for, like the late lesions in endemic syphilis, they generally occur in families where new infectious cases have been introduced.

The author finds that tertiary lesions may occur in individuals in combination with early infectious lesions. In this his experience differs from HACKETT [this *Bulletin*, 1947, v. 44, 527].

He shows that a low economic state and a higher incidence of children in a home favour the existence of yaws, but the size of the hamlet is unrelated. Previous arsenical treatment proved a potent modifying factor and should be considered when the value of subsequent penicillin treatment is being assessed.

In re-surveys, although households free of yaws in earlier surveys yielded the smallest percentage of cases of yaws, the actual number of households showing yaws, in houses which had previously been free from it, exceeded the number which had previously contained yaws. This anomalous result was due in part to the number of non-yaws households at the first survey being greatly in excess of yaws households. It emphasizes that treatment of yaws patients and known household contacts will not prevent the appearance of yaws in untreated households.

There was a significant improvement in serological response after administration of 6 ml. of PAM compared with 4 ml., but the groups were weighted by economic status also in favour of those treated with the larger dose [Klokke, *ibid.*, 1956, v. 53, 1003].

This painstaking study attempts to interpret the findings at what the author calls "moment-exposures" of the epidemic state of yaws by detailed analysis of one area. He succeeds in demonstrating factors

which must be taken into consideration in interpreting the effects of mass treatment.

Frederick J. Wright

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FREIRE, S. A. **Methods of Cultivation of the Hansen Bacillus. Slide Culture; Hemolysis-Tube Culture; Direct Inoculation of the Liquid Medium.** *Internat. J. Leprosy.* New Orleans. 1956, Jan.-Mar., v. 24, No. 1, 57-64, 4 figs. on pl. [14 refs.]

The author claims to have successfully grown *Mycobacterium leprae* and to have subcultured it up to 15 times by the time of his writing. He used Kirchner's medium with the addition of 0.1 per cent. agar and 20 per cent. human serum. Serum from a lepromatous patient was used for the primary isolation and normal serum for the subculture. Three methods have been used: a slide culture technique in which the organisms are fixed by immersion in 6 per cent. sulphuric acid; a modification of this slide technique in which the organisms are fixed to the side of a small tube; and direct inoculation into the medium. Only the last method was used for the subcultures.

Five successful isolations were made in 17 attempts with material from 12 lepromatous patients. The evidence for claiming organisms to be *Myco. leprae* is to be published elsewhere, but importance is attached to the formation of globi in the primary culture. [Globi do not form in subcultures or when the primary inoculum is not fixed.]

S. R. M. Bushby

FLOCH, H. **Utilisation de lepromines diluées (IV). Résultats de l'injection intradermique d'extrait phéniqué de peau normale chez des malades atteints des différentes formes de la lèpre.** [The Use of Diluted Lepromin; Results of Intradermal Injection of Carbolized Extract of Normal Skin in Patients suffering from Different Forms of Leprosy] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini.* Publication No. 394. 1956, May, 6 pp.

The antigen of Mitsuda, used in the lepromin test, is composed of 3 elements: the bacillus, leprous tissue and normal skin. Using the whole antigen, and comparing it with a suspension of normal skin as an antigen, the author found that (by the late reading) in tuberculoid cases 90 per cent. were positive to the former, and 54 per cent. to the latter. In lepromatous cases the early reading was positive in 25 per cent. with the skin antigen, and 17 per cent. with the whole antigen; but in both of these the late reading was negative.

Ernest Muir

CHAMBON, L. & DESTOMBES, P. Allergie à la tuberculine et à la lépromine et vaccination B.C.G. chez les lépreux. [Allergy to Tuberculin and Lepromin and BCG Vaccination in those with Leprosy] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 414-18.

After testing 492 untreated leprosy patients for their reactions to tuberculin and lepromin (189 being lepromatous, 162 tuberculoid, 46 reacting tuberculoid and 95 undifferentiated), the authors come to the conclusion that leprosy does not seem to affect the incidence of allergy to tuberculin because positive reactions to the Mantoux test are practically the same in leprous subjects as in those without leprosy. Both reactions were positive in about one-third of those with leprosy, most of them tuberculoid cases. In contrast, three-quarters of those allergic to tuberculin but not to lepromin were of the lepromatous type. It appeared therefore in the conditions of the experiment that allergy to tuberculin is not always sufficient to cause the appearance of allergy to lepromin. After vaccination with BCG, conversions to a positive lepromin reaction are always more frequent among those originally allergic to tuberculin.

Ernest Muir

FLOCH, H. & ANDRÉ, J. Sérologie de la lèpre; la réaction d'Ogata. [The Serology of Leprosy; Ogata's Reaction] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 393.* 1956, May, 8 pp.

Ogata claimed that he had found an antigen giving a serological reaction specific for leprosy. It depended on the proportion of cardiolipid to lecithin which it contained, the proportion 1 to 10 (antigen S) giving agglutination with syphilitic serum, and the proportion 1 to 1 (antigen L) giving agglutination with leprous serum.

The authors describe the method of Ogata for preparing the antigens and sera, and for performing the test. They obtained the results claimed by Ogata in only 3 out of 13 cases of lepromatous and borderline leprosy, and in none of the tuberculoid or undifferentiated cases; and in only 2 of the presumed normal serums was there complete absence of reaction. It is concluded that, whatever its value for recognizing syphilis, this antigen is not specific for recognizing leprosy.

Ernest Muir

CHATTERJEE, K. R. & PODDAR, R. K. Preferential Uptake of Sulphone by Affected Skin Tissue of Leprosy Patients as detected by a Tracer Method. [Correspondence.] *Nature.* 1956, Oct. 13, v. 178, 799-800.

Dapsone [DDS] labelled with ^{35}S and having a specific activity of 0.75 $\mu\text{c.}$ per mgm., was administered orally to 4 patients with single and to 5 patients with multiple leprotic skin lesions. At 6, 18, 24 and 144

hours samples of skin were taken from the lesions and from adjacent normal sites of different patients. (They were also taken at 72 hours from the 5th patient with multiple lesions.) Blood was taken at the same time.

The concentrations of sulphone in the various samples, deduced from their radio-activity, showed that although at 6 hours there is 2-3 times more drug in the blood than in normal skin and from then onwards the concentrations are approximately equal, the concentrations in the diseased skin are about 10 times higher than in the normal skin, irrespective of whether they are from patients with single or multiple lesions.

S. R. M. Bushby

HUEHNE, W. H., HI, W. Y. & SCHMIDT, W. Beobachtungen bei der Behandlung von Lepra mit Thiosemicarbazon (Conteben). Vorläufige Mitteilung. [Observations on the treatment of Leprosy with Thiosemicarbazone] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 358-61. [14 refs.]

The English summary appended to the paper is as follows:—

“ 98 leprosy patients in Korea showing an intolerance against or not reacting on sulphones were treated with thiosemicarbazone (conteben) during the course of one year. Good results were obtained in lesions of the mucous membranes and ulcerations of all kinds by local treatment combined with small oral doses.”

KIVITS, M. La lutte contre la lèpre au Congo belge en 1955. [The Campaign against Leprosy in the Belgian Congo in 1955] Fonds Reine Élisabeth pour l'Assistance Médicale aux Indigènes (FOREAMI). Sect. Père Damien. *Bull. d'Information sur la Lépre* No. 3. [Reprinted from *Acad. Roy. des Sci. Coloniales. Classe des Sci. Naturelles et Méd. Mémoires in-8°.* (n.s.) 1956, v. 4, No. 4, 61 pp., 20 figs. on 10 pls. (55 refs.).]

Leprosy was at first neglected in the Belgian Congo because of the absence of effective methods of treatment and because there were other more pressing medical problems. But in 1926 the Congo Red Cross began work with a centre at Pawa. This was supplemented in 1936 by the formation of the *Fondation Père Damien* for the fight against leprosy (FOPERDA). Later FOPERDA, *le Fonds du Bien-Être Indigène* (FBEI) and FOREAMI made it possible to augment the number of treatment centres. The work is coordinated by a provincial committee under the Governor of each province. The principle is to treat all non-infectious patients at out-patient clinics, and the more infectious lepromatous patients in leprosaria.

It was calculated in 1949 that there were about 215,000 leprous patients in the Congo, of whom about 90,000 were under treatment.

This makes a rate of about 2 per cent., but in the equatorial forest belt the percentage goes up to as much as 4 or 5 per cent. During the year 1955 about 184,686 patients, or about 86 per cent. of the whole, were under ambulatory treatment with DDS at urban polyclinics, rural dispensaries and temporary injection centres. DDS is generally given by injection of a slowly absorbed suspension once in 15 days.

A list of leprosaria for which special financial provision is made is given: 7 are Government, 1 FOREAMI, 1 Red Cross, 6 Catholic Missions, and 5 Protestant Missions, a total of 20 in all. Five of these are still in course of construction. In those in use there are about 13,820 patients.

The question of BCG vaccination and its possible raising of resistance to leprosy especially among children is being examined. This report is worthy of careful study in the original.

Ernest Muir

GOULDING, R. *Mycobacterium leprae murium: Preservation by Freeze-Drying.* *Internat. J. Leprosy.* New Orleans. 1956, Jan.-Mar., v. 24, No. 1, 74-9, 2 figs. [11 refs.]

Mycobacterium leprae murium from a grossly infected mouse were successfully freeze-dried. They were obtained by grinding the liver and spleen, suspending in Tween-saline, centrifuging at 1,500 r.p.m. for 10 minutes to remove coarse particles and resuspending the organisms in horse serum or glucose broth after further centrifuging at 5,500 r.p.m. Although viability tests in mice show that the dried organisms are viable and virulent after 6 months, they give no indication of the proportion still alive.

S. R. M. Bushby

HANKS, J. H. & FERNANDEZ, J. M. M. *Enhancement of Resistance to Murine Leprosy by BCG plus Specific Antigen.* *Internat. J. Leprosy.* New Orleans. 1956, Jan.-Mar., v. 24, No. 1, 65-73, 2 figs. [21 refs.]

In this paper the authors have endeavoured to ascertain whether the addition of a relatively small number of *Mycobacterium leprae murium* to an immunizing dose of avirulent tubercle bacilli will increase the immunity against rat leprosy. Two experiments are reported: in the first BCG was used, and in the second the R1Rv attenuated strain of tubercle bacilli was used in a more susceptible strain of rats than was used for the first.

In both experiments the combined antigen afforded greater protection than either given singly and the authors therefore conclude that although the tubercle bacilli are potent stimulators of immune response, their antigenic spectrum does not duplicate that of *Myco. leprae murium*, but when the specific antigens are included the specific response is increased.

The importance of these observations in relation to the human disease is discussed.

S. R. M. Bushby

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (schistosomes, other flukes); CESTODES (Diphyllobothrium, Taenia, Echinococcus, other cestodes); NEMATODES (Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).

SORESU, A., PANAITESCU, D., SOLOMON, P., HACIG, A. & BELLU, C. Cercetări helmintologice în cartierul Ostrov-Bucureşti. [Helminthological Investigations in the Ostrov District of Bucharest] *Studii si Cercetări Inframicrobiol., Microbiol. și Parazitol.* 1955, July-Dec., v. 6, Nos. 3/4, 605-19, 3 figs. & 1 folding plan. [22 refs.] French summary.

The authors have investigated the incidence of helminthiases in the Ostrov district of Bucharest, which consists of an island in Lake Fundeni connected to the land by a causeway. Hygienic conditions are bad; there is no sewerage, and drinking water is obtained from surface wells; the population is 1,777.

Of 1,501 persons investigated 804 (53.5 per cent.) were infected; 54 of 163 schoolchildren (33.5 per cent.) were suffering from enterobiasis. Single infections were present in 518 persons (*Trichuris* in 316; *Ascaris* in 160) and double infections in 266, the commonest being *Ascaris* with *Trichuris* (208 persons). The percentage of infections was 40 in children up to the age of 3 years, and reached a maximum value of 78 in the 6-15 year age-group. The distribution of cases is shown on a map; the incidence was highest in the south-west part of the island, which is damp and low-lying. Up to 2,500 eggs per kgm. were found in soil taken from the neighbourhood of infected households.

D. J. Bauer

PIGANIOL, G. & HERVÉ, A. L'épreuve de cristallurie provoquée chez les bilharziens. [Crystalluria in Persons with Schistosomiasis] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 458-62.

Calcification of the bladder, ureters, and seminal vesicles is a recognized complication of urinary schistosomiasis. It is in part due to the sclerosing lesions produced by the parasite, and in part to the petrifying action of the urine in this disease. For example, a piece of a sound left in the bladder of an African patient within a few days became encrusted with a massive calcareous deposit. Urinary lithiasis arises from calcification around a foreign body, such as epithelial debris or schistosome ova. In Egypt it is of frequent occurrence; but in the South African Bantu it is

rarely encountered, and is there considered to be due to phosphatic concretions secondary to bacterial infection, and not to be due to the schistosomiasis. Europeans there are more prone to urinary lithiasis than are the Africans, in whom schistosomiasis is common. In the United States, also, urinary lithiasis is rare in the coloured population.

Specimens of urine were systematically collected from African patients and examined for their crystal content in relation to their specific gravities and pH values. After the first morning specimen each patient drank 600 cc. of water, and then abstained from further fluid intake; thus there was a rising urinary concentration during the working day. The densities of the urines on the whole remained low; the mean of the maxima was 1021, and that of the minima was 1006. Most patients passed consistently acid urines; in a small number the pH varied during both day and night; in only one patient were the specimens almost wholly alkaline. All the patients passed crystals in their urine; urates were present in the acid specimens, and phosphates in the alkaline. In 17 cases of urinary schistosomiasis the crystalline deposits in all specimens were considerable, and were in excess of those found in the uninfected. This is doubtless the explanation of the tendency to stone formation in cases of urinary schistosomiasis; but the African does not so readily form urinary stones as do others, probably because he enjoys a racial immunity due to the excretion of protective colloids in the urine.

A. R. D. Adams

RITCHKEN, J. & SANDERS, E. **Urinary Bilharziasis: the Results of Treatment with Anthiomaline administered intravenously in Sixty-Two Cases.** *Central African J. of Med.* 1956, July, v. 2, No. 7, 249-53. [22 refs.]

The authors have treated a few patients suffering from *Schistosoma mansoni* infection with intravenous anthiomaline, some of them unsuccessfully. Sodium antimony tartrate, in large doses, therefore to them remains the drug of choice for this condition.

They treated with intravenous anthiomaline 62 patients with *S. haematobium* infections. Repeated urine examinations were done before and thereafter for at least 3 months, and in some cases for a year after treatment. The drug was given intravenously on alternate days; the initial dose was 0.5 ml. of a 6 per cent. solution; the second dose was 1.0 ml.; the third and subsequent doses were 2 ml. for children under 10 years and 2.5 to 3.0 ml for those older than this. The gross dosage was 40-45 ml. for children under 15 years, and 45-55 ml. for those above this age. The toxic effects were those usual with intravenous antimony, but they were infrequent and unobtrusive. As judged by the repeated urine re-examinations all the patients appeared to be cleared of their infections. Anthiomaline, given intravenously, in the authors' experience has proved the best method for the treatment of urinary schistosomiasis.

A. R. D. Adams

PIGANIOL, G., HERVÉ, A. & POURPRE. Complications cérébrales de la bilharziote à *Schistosoma mansoni*. [Cerebral Complications of *Schistosoma mansoni* Infection] *Bull. Soc. Path. Exot.* 1956, May-June, v. 49, No. 3, 450-55.

The authors give a report of this condition in a European male, aged 42 years and infected in Madagascar, together with a review of cases previously recorded in the literature. Neurological complications of a *Schistosoma mansoni*, as opposed to a *S. japonicum*, infection are rare. In this particular case the diagnosis of schistosomiasis was not established by recovery of eggs in the stools until 3 months after the onset of cerebral complications; these started with a left hemianopsia and progressed to epileptiform seizures, in the absence of the usual intestinal manifestations of the infection.

A. R. D. Adams

PARAENSE, W. L. & DESLANDES, N. "Australorbis inflexus" sp.n. from Brazil (Pulmonata, Planorbidae). Reprinted from *Rev. Brasileira Biologia*. 1956, July, v. 16, No. 2, 149-58, 7 figs. [10 refs.]

CHUNG, Huei-Lan, WENG, Hsin-Chih & LI, Jung. Use of "Liver-Ova Antigen" in the Immuno-diagnosis of Schistosomiasis. *Chinese Med. J.* Peking. 1956, July-Aug., v. 74, No. 4, 340-8. [22 refs.]

Intradermal and complement-fixation [CF] tests are those commonly used for the immunological diagnosis of schistosomiasis. One of the difficulties is the availability of effective antigens. The authors infected rabbits each with 800 to 1,000 cercariae of *Schistosoma japonicum* and killed them after 6 to 10 weeks. At this time the liver is enlarged and loaded with ova. After removal of as many as possible of the adult worms the egg-laden liver was made into a paste, spread as a film, and desiccated in a vacuum. The dried tissue was pulverized, sieved, and stored in the refrigerator. This powder constitutes "liver-ova antigen"; it can be produced easily and cheaply.

For use as an intradermal antigen, one part of the powder was added to 100 parts of normal saline containing a trace of ethyl mercuric thiosalicylate. After stirring and shaking, the mixture was refrigerated for 48 hours and then after further shaking centrifuged. The clear supernatant (a 1 per cent. saline extract) was ready for use as antigen for intradermal tests. The antigen for the CF test was produced as a 2 per cent. extract similarly prepared, but extracted for 24 and not 48 hours; no ethyl mercuric thiosalicylate was added as it was freshly prepared before use.

The actual intradermal test was carried out by the injection of 0.1 ml. of a 1 in 1,000 dilution of the antigen into one forearm, and 0.1 ml. of a 1 in 2,000 dilution into an area not nearer than 10 cm. The results were

read in 15 minutes—a positive was a wheal of at least 1 cm. diameter without pseudopod formation, and erythema extending for more than 2 cm.; a negative was a wheal less than 1 cm. and surrounded by erythema under 2 cm. in diameter. A strongly positive was read when there were a wheal of 1 cm. with pseudopod formation, and a surrounding erythema of 4 cm. The complement-fixation test was done with Kolmer's half-volume technique as for the Wassermann test.

Seventy-eight of the patients with *S. japonicum* infections were tested intradermally, and 141 were the subjects of the CF test. The results are set out in tables. These accord with the results previously obtained with adult worm or with cercarial antigens. The "liver-ova" antigen proved more sensitive for the skin test than as an antigen for the CF test; but the latter was more reliable in determining the effect of treatment. A negative CF after treatment can be taken to indicate eradication of the infection. [See also this *Bulletin*, 1955, v. 52, 459.] *A. R. D. Adams*

BEARUP, A. J. Life Cycle of *Austrobilharzia terrigalensis* Johnston, 1917.
Parasitology. 1956, Nov., v. 46, Nos. 3/4, 470-79, 9 figs. [10 refs.]

"1. The life cycle of *Austrobilharzia terrigalensis* Johnston, 1917 is described. The larval stages occur in *Pyrazus australis*, a common mollusc on sand flats of estuaries and coastal lagoons in New South Wales.

"2. *Austrobilharzia terrigalensis* was originally described from the seagull, *Larus novae-hollandiae*. Experimental infections have been successful in young gulls of this species and in the budgerigar *Melopsittacus undulatus* and the pigeon *Columba livia*.

"3. Under experimental conditions the cercariae will cause dermatitis, and cases of dermatitis resembling cercarial dermatitis have been reported after bathing in Narrabeen Lagoon, where about 4% of *Pyrazus australis* carry forktail cercariae.

"4. The cercaria was described previously (Bearup, 1955) as *Cercaria variglandis* subspecies *pyrazi*, new subspecies. Now that the adult form has been identified as a previously described species the subspecific name *pyrazi* lapses."

[See this *Bulletin*, 1956, v. 53, 219.]

JENNINGS, F. W., MULLIGAN, W. & URQUHART, G. M. Radioisotope Studies on the Anemia produced by Infection with *Fasciola hepatica*.
Exper. Parasit. New York. 1956, Sept., v. 5, No. 5, 458-68. [15 refs.]

"Red cells labelled with P^{32} and serum albumin labelled with I^{131} have been used to study the anemia associated with *F. hepatica* infections in rabbits and to make an estimate of the amount of the daily blood

loss. The blood loss as calculated from P^{32} experiments is of sufficient magnitude to account for the anaemia.

"When I^{131} -labelled serum albumin and P^{32} -labelled red cells were used simultaneously it was found that the P^{32}/I^{131} ratio in the flukes was consistently higher than that in the blood.

"The use of radioisotope techniques in the study of this type of problem is discussed."

PYLKÖ, O. O. Cholinesterase in *Diphyllobothrium latum* and *Taenia saginata*. *Ann. Med. Exper. et Biol. Fenniae.* Helsinki. 1956, v. 34, No. 3, 328-34, 1 fig. [18 refs.]

"The writer has observed that the tapeworms *Diphyllobothrium latum* and *Taenia saginata* contain a specific acetylcholine-hydrolysing enzyme as well as another enzyme with ability to split benzoylcholine."

NYBERG, W. & ÖSTLING, G. Low Vitamin B₁₂ Concentrations in Serum in Fish Tapeworm Anaemia. [Correspondence.] *Nature.* 1956, Oct. 27, v. 178, 934-5.

Serum concentration of vitamin B₁₂ varies in normal people from 70-100 $\mu\mu\text{gm.}$ to 420-900 $\mu\mu\text{gm.}$ per ml., according to the microbiological method used. Values less than 50 $\mu\mu\text{gm./ml.}$ have been found in pernicious anaemia. The megaloblastic anaemia of *Diphyllobothrium latum* carriers has a blood picture similar to that of pernicious anaemia. The essential factor in its causation seems to be deprivation of the host of vitamin B₁₂ by the tapeworm [this *Bulletin*, 1956, v. 53, 1023]. The authors have checked this by microbiological assay of the serum of 8 persons with *D. latum* anaemia and of 20 control subjects convalescing from various other diseases. The method used did not accurately measure less than 50 $\mu\mu\text{gm./ml.}$

A table shows that 7 of the 8 patients with tapeworm anaemia gave vitamin B₁₂ concentrations less than 50 $\mu\mu\text{gm./ml.}$ and the eighth showed only 65 $\mu\mu\text{gm./ml.}$ In the control group there was great variation, *viz.* 180 to 964 $\mu\mu\text{gm./ml.}$ with an average of 561 $\mu\mu\text{gm./ml.}$

These studies show that the B₁₂ concentrations in fish tapeworm anaemia are of the same range as those in true pernicious anaemia and support the view concerning B₁₂ deficiency in *D. latum* carriers with anaemia. The authors recognize the need for more material and a more accurate technical method.

H. J. O'D. Burke-Gaffney

WATSON, K. C. & LAURIE, W. Cerebral Coenuriasis in the Bantu. *South African Med. J.* 1956, Oct. 6, v. 40, 964-5, 1 fig.

"A case of cerebral coenuriasis is presented. This is the larval stage of *Multiceps multiceps* and infestation in man occurs on occasion. The

clinical features are those associated with a space-occupying lesion of the skull."

[See this *Bulletin*, 1956, v. 53, 624.]

BAER, J. G. **The Taxonomic Position of *Taenia madagascariensis* Davaine, 1870, a Tapeworm Parasite of Man and Rodents.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 152-6, 4 figs. [16 refs.]

The author describes two tapeworm specimens from a 5-year-old child and a 19-year-old youth in Mauritius, which had been collected by Dr. A. R. D. Adams and were at the Liverpool School of Tropical Medicine. He identifies these as *Inermicapsifer madagascariensis* which is a new combination for *Taenia madagascariensis*. The specimens are identical with *I. arvicanthidis* which thus becomes a synonym of *I. madagascariensis*. Since FAIN (1950) [this *Bulletin*, 1951, v. 48, 174] showed that *I. arvicanthidis* is identical with *I. cubensis*, the latter species also becomes a synonym of *I. madagascariensis*. A complete list of synonyms is appended and after an interesting discussion on the geographical range and the human and rodent hosts of this and other related tapeworms the author concludes: "Except for the ubiquitous black rat, none of the wild rodents of Cuba or Madagascar belong to species, or even to genera, that are found in Africa, while in the Comoro Islands and in Mauritius there do not appear to be any autochthonous rodents at all. It therefore seems possible that, outside Africa, *I. madagascariensis* has become adapted to man, and the suggestion is made that the species may have been introduced into the Malagasy region by creole labour brought over from the West Indies by French settlers."

J. J. C. Buckley

MIMIOGLU, M. & AKYOL, M. Über das Vorkommen von Hakenwürmern und anderen Wurmparasiten in der Provinz Hatay (Türkei). [Detection of Hookworms and Other Helminthic Parasites in Hatay Province, Turkey] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 3, 311-16, 1 map.

The English summary appended to the paper is as follows:—

"Hookworm infestation was surveyed in the Turkish province of Hatay bordering the Gulf of Iskenderun (Alexandretta). A number of villages in the Asi (Orontes) valley between Antakya (Antioch) and Samandagi, also between Iskenderun and Arsuz near the Mediterranean, showed an uncinaria index up to 88.8 per cent while villages situated above 2000 feet were free of hookworms. *Ancylostoma duodenale* was found exclusively. Furthermore, eggs of *ascaris* and *taenia* could be proved in a numerous percentage. Five human infections with *Trichostrongylus colubriformis* were found, the first discovered in Turkey."

MELVIN, Dorothy M., SADUN, E. H. & HEIMLICH, C. R. **Comparison of the Direct Smear and Dilution Egg Counts in the Quantitative Determination of Hookworm Infections.** *Amer. J. Hyg.* 1956, Sept., v. 64, No. 2, 139-48, 2 figs. [15 refs.]

"Fecal samples from human beings, dogs and rats were used to compare the variability of egg counts by the smear and dilution methods in the quantitative determination of hookworm infection. In human specimens very little deviation from random distribution was found by either technique. Significant over-dispersion was observed in a few samples with a high number of eggs."

Under the heading Discussion, the authors state that "On the basis of our experimental findings it is concluded that, although both techniques can be employed effectively in estimating the magnitude of hookworm infections in a single examination, the dilution count offers a more accurate quantitative determination. However, the direct smear technique can be performed routinely in approximately half the time necessary for the dilution count":

R. M. Gordon

MIRANDA, M. Contribución al estudio de la médula ósea en niños con anquilostomiasis y tricocefalosis. [Study of the Bone-Marrow in Children with Ankylostomiasis and Trichuriasis] *Rev. Biología Trop.* San José, Costa Rica. 1956, July, v. 4, No. 1, 69-77.

The English summary appended to the paper is as follows:—

"1. A study is made of the bone marrow in 13 patients with a characteristic clinical picture of ancylostoma infestation and in 28 with a clinical picture of trichocephalus infestation. From the parasitological viewpoint most of these patients had mixed (ancylostoma and trichocephalus) infestation.

"2. In all cases, sternal puncture was used, aspirating from 0.3 to 0.5 cc. of bone marrow.

"3. In the 13 ancylostomiasis patients, all with severe anemia, the most important findings in the bone marrow were: marrow cellular hyperplasia in two cases; hyperplasia of the normoblastic series, sometimes conspicuous, in 10 cases; absence of a close relationship between the degree of anemia and that of normoblastic hyperplasia of the marrow; increase of eosinophiles in the marrow in 12 cases; and absence of a relationship between the degree of eosinophilia in the bone marrow and in peripheral blood.

"4. In the 28 trichocephalus patients, of which 25 had a mixed infestation (ancylostomes), the most important findings were: marrow cellular hyperplasia in 11 cases; increase in megacaryocytes in 13 cases. The highest megacaryocyte counts were obtained in the most cellular marrows. Normoblastic series hyperplasia was less frequent than in the previous,

where anemias were more severe. Increase in marrow eosinophile counts was observed in 18 cases."

SHETH, U. K., KEKRE, M. S. & LEWIS, R. A. **Treatment of Ancylostomiasis with Win 5047.** *Antibiotic Med.* New York. 1956, Aug., v. 3, No. 3, 197-8.

Win 5047, or N-(2,4-dichlorobenzyl)-N-(2-hydroxyethyl) dichloroacetamide, also known as Mantomide, was used in Bombay for the treatment of 26 adult patients suffering from severe ankylostomiasis with gross clinical manifestations of the infection. The dose was 750 mgm. thrice daily for 3 days, and this was well tolerated even by anaemic and debilitated patients. Hookworm ova vanished from the stools of 22 patients; re-treatment of 2 of the patients not cured by the treatment resulted in clearance of the stools of one of them and substantial reduction in the egg count of the other. [See also this *Bulletin*, 1954, v. 51, 1064 and 1065.]

A. R. D. Adams

DESCHIENS, R. & BÉNEX, Jacqueline. Hyperéosinophilie liée à une impasse parasitaire expérimentale de *Strongyloides fulleborni* chez le cobaye. [Eosinophilia associated with a Parasitological "Impasse" experimentally established by exposing a Guineapig to Infection with *Strongyloides fulleborni*] *Bull. Soc. Path. Exot.* 1956, Mar.-Apr., v. 49, No. 2, 285-92, 2 figs. [10 refs.]

The authors' summary in French is freely translated as follows:—

The similar reactions of the guineapig and man to eosinophilogenic stimuli together with an interest in the study of parasitological *impasses* [e.g. the failure of *Ancylostomum caninum* to complete its development in man] have led us to investigate if an experimental *impasse*, established in a guineapig by exposing it to infective larvae of *Strongyloides fulleborni* (Linstow, 1905) from a chimpanzee, would give rise to a tell-tale eosinophilia.

In 6 guineapigs showing normal eosinophil counts, which were inoculated subcutaneously with larvae of *S. fulleborni*, an upward surge of eosinophils occurred which was similar in all 6 and corresponded with the inoculation. Four days after exposure the increase appeared and reached a peak between the 10th and 20th days; on an average, the percentage level of eosinophils increased by 12 times and the actual number in a cu. mm. of blood by 23 times.

The possibility of causing experimentally such *impasses* in the guineapig, which are only revealed by a wave of hypereosinophilia, is of interest both from the point of view of the study of the aberrations of helminths and that of the aetiology and interpretation of essential data on eosinophilia.

J. J. C. Buckley

ASAOKURA, S. **Crystallographic Studies on the Eggs of Various Human Parasites. I. Observation with Polarization Microscope.** *Tohoku J. Exper. Med.* 1956, Aug. 25, v. 64, No. 2, 105-15, 7 figs. [15 refs.]

The author supplies evidence that the presence of *Ascaris lumbricoides* in the bile ducts of man, a complication which is "frequently observed" in Japan, not only causes changes in the composition of the bile, but the eggs and cuticle of the imprisoned *Ascaris* may form the nuclei of gallstones. In order to investigate more fully the part played by different species of helminths and their eggs in the formation of such gall-stones, the eggs of "ascaris lumbricoides, hookworm, trichostrongylus orientalis, trichocephalus trichiurus and clonorchis sinensis were used and the shells of these eggs were examined in the main under a polarization microscope, as described below. In the case of ascaris eggs, the nature of their albuminoid membranes has also been investigated". The results of the investigations are presented, both in photographs and in writing, as comparisons made between the nature of the eggs when seen under an ordinary microscope and when seen under a polarization microscope. The conclusions reached are stated as follows:—

"1. The shells of the eggs of human parasites, such as ascaris lumbricoides, hookworm, trichostrongylus orientalis, trichocephalus trichiurus and clonorchis sinensis are crystalline in structure. Of these, the fertilized eggs of ascaris are the stablest.

"2. The second from the outside is the stablest of the four layers of the ascaris egg-shell. The crystals in this layer are arranged radially.

"3. The shells of the eggs of hookworm and trichostrongylus orientalis, which hatch rather early, show the lowest degree of double refraction and are frail in their crystallographic structure, the eggs of trichocephalus trichiurus and clonorchis sinensis coming next. The former have crystalline shell substance also under the stopper-like projection at their ends.

"4. The albuminoid membrane covering the egg of ascaris may become a basis to initiate precipitation of calcium compounds when putrefied. This fact, coupled with the crystallographically stable structure of the shell, gives the highest importance of all foreign matters to be found in human bile to fertilized ascaris eggs as nuclei of biliary stones."

[See also this *Bulletin*, 1956, v. 53, 1363.]

R. M. Gordon

ASAOKURA, S. **Crystallographic Studies on the Eggs of Various Human Parasites. II. Spectroscopy of Fertilized Ascaris Egg Shells.** *Tohoku J. Exper. Med.* 1956, Aug. 25, v. 64, No. 2, 117-20.

The author, having reached the conclusion that when helminthic material forms the nucleus of gall stones the shells of fertilized *Ascaris* eggs play the most important role in their production, decided to

investigate this aspect more fully. Washed fertilized *Ascaris* eggs which had been dissected out of the uterus of the female worms were subjected to qualitative spectral analysis with results which are summarized as follows:—

“ Four rounds of experiments were made with fertilized eggs extracted from different ascaris each round. The wave-lengths of the lines appearing in the spectra of the specimens were of course determined with reference to the known wave-lengths of the spectral lines of iron as usual and special care was taken to collate the lines of copper with those of spectrum of copper sulfate. The composition of egg shells thus analysed was nearly constant in all the specimens, only some slight inequality in the tone of some lines being perceptible.

“ The elements composing the fertilized ascaris egg shells and the wave-lengths of their spectral lines, according to the results of these experiments, are listed below.

1)	Ca	3158.9 3179.3 3359.3 3938.7 (U1) 3968.5 (U2) 4225.4 4226.7	2)	Mg	2779.1 2781.4 2795.5 (U3) 2802.7 (U2) 2852.1 (U1) 3936.5
3)	Si	2506.9 2524.1 2528.5 2881.6 (U1)	4)	Fe	2382.0 2395.6 2599.4 2749.3 2755.7
5)	Cu	3247.5 (U1) 3274.0 (U2) 3370.4	6)	P	2534.0 2535.6 2558.3 2554.9

(In one specimen, the appearance of the spectral lines of P was somewhat doubtful.) ”

R. M. Gordon

NOEL-BUXTON, M. B. Field Experiments with DDT in association with Finely Divided Inorganic Material for the Destruction of the Immature Stages of the Genus *Simulium* in the Gold Coast. *J. West. African Sci. Ass.* 1956, Feb. 1, v. 2, No. 1, 36-40.

High incidence of onchocerciasis in river staff, and prospects of dosage of rivers with organic insecticides regardless of effects on fish, stimulated the present experiments by the Fishery Department of the Gold Coast. It was hoped to determine satisfactory low dosages of DDT when introduced, mixed with suspended clay, into rivers. One part DDT (in 10 per cent. solution in kerosene), 10 parts soap, and 100 parts local clay were mixed at 85°C. to 95°C. in a 20-gallon field kitchen for three hours and used at 0.03 and 0.044 p.p.m. of water on the Rivers Kamba and Black Volta. Although the formulation was evolved empirically and needs improvement, very satisfactory kills of *Simulium* larvae resulted without

ill-effects on fish or oysters. Complete larval destruction was obtained for at least 40 miles below the treatment points. Bites of adults were reported as almost negligible by users of the rivers up to 70 miles from the treatment point on the Black Volta.

D. S. Bertram

HUCKER, A. G. & SCHOFIELD, F. D. Whipworm Infections. Trial of Four Piperazine Compounds. *Brit. Med. J.* 1956, Nov. 17, 1159-60.

Infections with *Trichuris trichiura* are usually symptomless and in light infections ova appear irregularly in the stool. To ascertain if a drug is effective against this helminth a quantitative estimation of ova counts in stools in heavy infections is more likely to give a reliable indication than an apparent freeing of the stools in light infections. The occurrence of heavy infections in a hospital for mental deficiency gave the authors the opportunity to evaluate the following 4 compounds of piperazine—the phosphate, sebacate, adipate and citrate. A group of 17 or 18 patients were treated with each drug—in dosages equivalent to 500 mgm. of piperazine hexahydrate 3 times daily for 7 days. The mean differences in egg counts before and after treatment showed no significant differences. It is therefore concluded that none of the 4 drugs tested in doses which are effective in the treatment of *Ascaris lumbricoides* and *Enterobius vermicularis* are effective against *T. trichiura*.

[This disappointing result contrasts with the apparent success achieved with the use of piperazine adipate by DUNN (this *Bulletin*, 1955, v. 52, 666).]

Frederick J. Wright

HILL, R. D. Mass Therapy with Piperazine Adipate in the Control of Threadworm Infestations. *Brit. Med. J.* 1956, Nov. 17, 1156-9, 6 figs.

The author is the sole medical practitioner on an island in the Shetland Islands with a population of 866 of whom 194 are children aged 1 to 4 years. Examination of a sample of 50 children by adhesive "cellophane" tape swabs showed 32 to be infected with *Enterobius vermicularis*. (No child was considered to be uninfected until 5 negative swabs had been obtained.) Of the 50 children 16 had symptoms suggestive of enterobiasis and of these 15 yielded ova. Positive swabs were also obtained from 17 of the 34 who were symptomless.

Mass treatment of every child on the island was then attempted with piperazine adipate in a daily dose of 300 mgm. per year of age, up to a maximum of 1.8 gm.; the drug was given for 7 days, stopped for 7 days and then given again for 7 days. The chemotherapy was supported by instructing all mothers in general hygienic measures by the circulation of pamphlets. It is considered that 96 per cent. of the children probably received the treatment.

Two weeks after the treatment only 2 of the 32 children in the sample group who were previously found to be infected still yielded ova and it transpired that these 2 had defeated the mother's attempts to administer the tablets. However 6 months later 20 of the 50 children in the sample group were again positive. The author concludes that piperazine adipate is an effective and safe vermicide but parents (particularly mothers) also require to be treated to prevent reinfection of their children. The symptoms of pruritus, teeth-grinding and nightmares were relieved but only 1 out of 6 children suffering from enuresis appeared to be cured.

Frederick J. Wright

DEFICIENCY DISEASES

INTERNATIONAL CONGRESS OF NUTRITION. 3rd. Amsterdam, September 13th-17th, 1954. Reprinted from *Voeding*. 's-Gravenhage. 1955, v. 16, 486 pp., numerous figs. [Numerous refs.]

The organizers of this Congress wisely decided to concentrate the interest and chose 3 topics for special discussion. These were obesity, protein malnutrition and food additives. This was a happy choice for the first 2, representing perhaps the most important nutritional problems in the Western and Eastern worlds respectively. The third topic may be, indeed almost certainly is, of immense practical significance, but, as the papers show, suitable methods for investigation of the many problems have not yet been developed. The main speakers were also well chosen and included those with experience in all 5 continents. It was a pleasure to attend the meetings. Those who were not able to do so can now read the proceedings. Probably nowhere else is it possible to get so well balanced an account of the present state of knowledge of these important topics.

In addition to the main discussions there were several subsidiary papers. The abstracter found one on the psychological aspect of nutrition and another on nutrition research of special interest to FAO most valuable.

Our Dutch hosts organized the Conference with great ability. Professors B. C. P. JANSEN, M. VAN EKELEN and M. J. L. DOLS were mainly responsible and we are now further indebted to them for bringing out the proceedings promptly and in an attractive style. R. Passmore

METABOLISM. New York. 1956, May, v. 5, No. 3, 203-301. **Symposium on Nutrition** [POLLACK, H., Special Editor]. **Studies on Nutrition in the Far East. I. The Problem and Outline of the Test Protocol** [POLLACK, H.]. 203-18, 2 figs. **II. Biochemical Findings before and after Enrichment of Rice with Vitamins** [CONSOLAZIO, C. F.,

CROWLEY, L. V., ARMSTRONG, F. B., DORSCH, I. F., GUILLORY, R. L. & POLLACK, H.]. 219-30. [21 refs.] **III. Clinical Indicator Signs of Nutritional Insufficiencies before and after Enrichment of Rice with Synthetic Vitamins** [POLLACK, H.]. 231-44, 1 text fig. & 8 coloured figs. on pl. **IV. Mess Practices in the Chinese Nationalist Army and the Field Test of a Proposed Enriched Ration** [CROWLEY, L. V., GODBER, J. T., CONSOLAZIO, C. F., GOLDSTEIN, D. R., SMITH, E. P., LEWIS, O. H., RYER, R. R. & POLLACK, H.]. 245-58, 7 figs. [11 refs.] **V. Calorie Cost of Work and Energy Balance Studies** [CONSOLAZIO, C. F., POLLACK, H., CROWLEY, L. V. & GOLDSTEIN, D. R.]. 259-71, 1 fig. [28 refs.] **VI. Relations between Body Weight, Height and Skinfold Thickness Measurements in Chinese Nationalist Troops** [CROWLEY, L. V., RYER, R. R. & POLLACK, H.]. 272-5, 3 figs. **VII. The Problem of Rice Supplementation** [POLLACK, H.]. 276-8. **VIII. Protein Partitions in the Blood and some Notes on Total Lipids** [JEFFERIS, T. C., CONSOLAZIO, C. F. & POLLACK, H.]. 279-82. **IX. Correlations between Clinical Signs and Biochemical Findings** [BROCKETT, J. E., Jr., CROWLEY, L. V. & POLLACK, H.]. 283-6. **X. Composition of Food Items in the Formosan Diet** [CONSOLAZIO, C. F., ARMSTRONG, F. B., DOSCH, E. L., GOLDSTEIN, D. R. & GUILLORY, R. L.]. 287-91. **XI. Ophthalmic Findings** [POLLACK, H. & EBY, T. M.]. 292-6. **XII. The Relation of Intensity of Hookworm Infestation to Changes in Body Weight and Clinical Signs of Nutritional Deficiency** [CROWLEY, L. V., POLLACK, H. & BROCKETT, J. E., Jr.]. 297-301.

The opportunity to make nutritional studies on large numbers of persons living on accurately controlled diets for many months, seldom arises. The 12 papers which follow describe the clinical and laboratory findings in 1,200 Chinese soldiers who lived for over 5 months on 2 diets, in each of which rice was the chief ingredient, but which differed markedly in the content of many of the principal vitamins. Dr. Herbert Pollock organized the survey with great thoroughness. He was fortunate to have the assistance of a large number of American and Chinese colleagues who had collected and analysed the data with meticulous attention to detail. Everyone concerned with nutritional problems in the Far East will want to read the full report carefully. The abstracts of the 12 papers that follow indicate that although the team have made no striking new discovery (as indeed was hardly likely), they have added greatly in many instances to the precision of old knowledge and have, on occasions, pointed the way to new findings of interest. All concerned are to be congratulated on the manner in which they have responded to a most unusual opportunity.

I. The nutritional status of the troops of the Republic of China has long concerned responsible officials. In 1945 a nutritional survey was carried out by YOUNMANS who reported a high incidence of ariboflavinosis:

other American observers in 1951, 1952 and 1953 found a high incidence of vitamin B deficiencies.

In a pilot study in 1954 of 711 persons in 14 different military units in widely scattered areas of Taiwan, nasolabial seborrhoea, angle cheilosis, magenta tongue and folliculosis were all found to be common and in some units more than half the men showed one or more of these signs. The rationing of the army is complicated, but in most units the men receive a large quantity of rice (about 785 gm. per day), a part of which can be exchanged for other foods. Under this arrangement the nutritional value of the food actually consumed was far from satisfactory.

At a conference in Washington in 1954 it was decided to hold a field trial of an improved ration scale which would include enriched rice. The subsequent papers in this series describe the results of the trial. The actual rations are given in Paper IV. For the trial 6 companies, approximately 2,000 men, were sent to a test area on the coastal plane. Observations were made on 1,200 of these men who were on the ration scales from October 1954 to February 1955.

II. The vitamin contents of the diets were:—

	Vitamin A	Carotene μgm./day	Thiamine mgm./day	Riboflavin mgm./day	Ascorbic acid mgm./day
Control Diet	...	0	3.77	1.48	0.86
Enriched Diet	...	0	5.98	3.85	4.56

These are average figures. Vitamin A and carotene levels in the blood were:—

	Vitamin A μgm./100 ml.	Carotene μgm./100 ml.
Before Control Diet	...	26.6
After Control Diet	...	32.2
Before Enriched Diet	...	25.2
After Enriched Diet	...	43.7
Before Enriched Diet	...	26.5
After Enriched Diet	...	28.7
		74.1

Levels of urinary excretion were as follows:—

	Thiamine μgm./hr.	Riboflavin μgm./hr.	N methyl N μgm./hr.
Before Control Diet	...	2.81	194.9
After Control Diet	...	5.49	330.9
Before Enriched Diet	...	2.42	221.3
After Enriched Diet	...	35.43	898.0

These analyses were carried out on samples of urine collected between midnight and 6 a.m. The findings are interpreted as indicating that many of the men were deficient in vitamin A, carotene, thiamine, riboflavin, ascorbic acid and niacin at the beginning of the test period. Enrichment of rice with the appropriate vitamins can remedy the biochemical deficiency. The carotene present in yellow sweet potatoes was also

available for metabolism. The level of enrichment with synthetic vitamins during the test was considered to be unnecessarily high.

At the beginning of the test, haemoglobin (15.5 gm./100 ml.), haematocrit (46 per cent.) and serum protein (7.63 gm./100 ml.) values were normal and remained substantially unchanged. The Chinese army ration is normally adequate in proteins.

III. The men were submitted to a detailed clinical examination in October before going on the diets and again at the end of February. The findings are set out in 9 tables from which the following has been abstracted.

Number of men		Severe Glossitis	Percentage of men with:			
			Naso-labial Seborrhoea	Scrotal Dermatitis	Angular Stomatitis	
542	Before regular diet ...	... 44.8	80.6	18.1	70.4	
	After regular diet ...	... 69.3	82.8	86.9	78.7	
507	Before enriched diet	... 47.3	82.0	16.0	71.7	
	After enriched diet ...	... 20.7	22.2	1.9	18.1	

Thus approximately 80 per cent. of the men had some evidence of ariboflavinosis and over 15 per cent. had the oral genital syndrome. Enrichment of the rice brought about a marked remission of these signs attributable to riboflavin and niacin deficiency.

There was no evidence of protein malnutrition, or of calcium deficiency and no overt signs of beriberi.

Folliculosis, which is commonly ascribed to vitamin A deficiency, was widespread. It was studied in different areas of the body. On the enriched diet, the incidence on the back fell markedly from 28.4 to 1.9 per cent., but the incidence of the disease on the thighs increased from 10.4 to 63.1 per cent. and on the elbow from 38.6 to 83.4 per cent. The findings are difficult to interpret and it is suggested that traumatic conditioning factors must be present.

Although the eyes were examined and among the excellent coloured photographs there is a picture of an early Bitot's spot, the records for the eye examinations have been omitted [but see paper XI below]. The summary states that approximately 30 per cent. of the troops manifested signs attributable to vitamin A deficiency, but it is not clear from the text on what this figure is based.

A suggested daily vitamin supplement for these rice-eating people is thiamine 1 mgm.; riboflavin 3 mgm.; niacin 15 mgm.; carotene 5,000 units or vitamin A 3,000 units; and vitamin C 20 or more mgm.

[This is a very important paper. It is the first properly controlled study in which the beneficial effects of enriched rice have been unequivocally demonstrated. That enrichment of a cereal with vitamins is a practical and beneficial policy under certain circumstances, there can now be no doubt. The abstracter has, however, yet to be convinced that it is a desirable long-term policy for a large population either of rice-eaters in the East or of wheat-eaters in Britain.]

IV. This paper gives detailed accounts of the rations and the messing practices of the men. This is a most important paper for those intimately concerned with the health of the Nationalist Army. For general readers it will suffice to state that the average consumption (gm./man/day) in the 2 messes was:—

		<i>Regular ration</i>	<i>Enriched ration</i>
Rice ...	...	620	488
Flour ...	...	165	131
Sweet potatoes ...	...	—	200
Soya beans ...	...	62	62
Edible oil ...	...	19	19
Fish ...	...	18	84
Pork ...	...	38	31
Beef ...	...	16	—
Vegetable: leafy ...	...	192	212
root ...	...	234	211
Miscellaneous ...	...	95	93

Each premix rice supplement provided 2.1 mgm. thiamine, 5.4 mgm. riboflavin, 21.5 mgm. niacin and 14.0 mgm. iron per man daily.

The mean intake of nutrients per man per day was as follows:—

		<i>Regular ration</i>	<i>Enriched ration</i>
Calories ...	...	3610	3380
Protein gm. ...	...	95	105
Fat gm. ...	...	77	60
Carbohydrate gm. ...	...	630	605
Vitamin A ...	...	0	0
Carotene mgm. ...	...	3.77	5.48
Thiamine mgm. ...	...	1.43	3.35
Riboflavin mgm. ...	...	0.86	4.55
Vitamin C mgm. ...	...	68	93

V. This paper records the daily energy expenditure of the men in the 2 groups as determined by a combination of time studies and measurements of energy expenditure by indirect calorimetry. Ten men in each ration group acted as subjects for this study which lasted one week. Mean energy expenditure for the men was 3,348 Cal./day for 6 active days, 2,306 Cal./day for a rest day and 3,288 Cal./day for the whole week. The men carried out a route march each day for 3 to 6 hours and in addition on some days spent about 2 hours playing basket-ball and volley-ball, and about 2 hours on labour duties. On 2 days the march lasted 6 hours and there were no games and very few fatigues. The energy cost of the various activities does not appear to have differed in any important respect from figures given in the literature for other active men.

A new finding was the observation that the energy expenditure of the men on the enriched diet was less than the energy expenditure of the men on the control diet when carrying out the *same* activities. The men on the enriched diet had a lower basal metabolic rate and also lower rates of metabolism when carrying out hard work such as walking with a 30 kgm. load. The differences were of the order of 5 to 10 per cent. It is pointed out that this relationship between vitamin deficiency states and the efficiency of performance of daily activities, is in contrast to

previous studies on well-nourished individuals. Massive doses of vitamins given to well-nourished persons do not increase work efficiency.

VI. The mean figures for 1,049 Chinese soldiers were—age 26.8 years, height 164.5 cm., weight 55.5 kgm., skinfold thickness—subscapula 0.79 cm., midarm 0.42 cm.

VII. Barley, maize, cassava, yellow sweet potato, wheat and plantain can all be used as partial substitutes for rice. Each has important nutritional factors that are lacking in rice. Yellow sweet potatoes, for instance, while poor in total protein, may supply specific amino-acids in addition to pro-vitamin A and vitamin C. The basic problem is to define the most efficient substitutes and supplements for rice in terms of nutrition, availability and economy.

VIII. The following mean values were obtained, all figures in gm. per 100 ml. of serum:—

	<i>Control diet</i>			<i>Enriched diet</i>
Total protein	7.04
Albumin	3.41
Total globulin	3.64
α_1	0.26
α_2	0.60
β_1	0.99
β_2	0.01
γ	1.77
Total lipids	0.657

The protein figures fall within normal ranges, but it is pointed out that although the fat content of the diet was low, the values for total serum lipids were higher than the figures usually quoted as normal for Americans. A high standard deviation 0.168 and 0.128 for the two groups reflected large individual variations in serum lipids.

IX. This paper attempts a statistical correlation between the biochemical data (paper II, above] and the clinical data [paper III, above]. A strong negative correlation exists between the level of riboflavin excretion and the incidence of angular cheilosis, magenta colour of the tongue, atrophy of the tongue papillae and scrotal dermatitis. There is also a negative correlation between urinary N methyl N (niacin intake) and filiform and fungiform papillary lesions of the tongue. Blood vitamin A and carotene levels are also negatively correlated with follicularizations of arms, back and chest.

X. This paper records the analyses of over 100 Formosan foods for moisture, protein, fat, ash, vitamin A, thiamine, riboflavin, ascorbic acid and carotene. This is a notable addition to our knowledge of the nutritive value of Far Eastern foods.

XI. A full ophthalmic examination of 1,049 men was carried out. Evidence of old trachoma was present in 17 per cent. About 70 per cent. of the men had spot lesions of the conjunctivae and about one-third of these were pigmented. A high degree of conjunctival vascularity was also present. Although these lesions are often ascribed to nutritional defects, there was no significant difference between the controlled and enriched

groups at the end of the test period. It is suggested that if these conditions are nutritional in origin, either the changes are irreversible, or longer periods of therapy are necessary for reversal. On the whole, the vision of the men was excellent. However, 5 had signs of optic atrophy. The men examined were all reputedly fit and optic atrophy is probably commoner in the army as a whole than this figure suggests. Most of the men with optic atrophy had histories of gradual, painless loss of vision beginning in 1949 when the men moved to Formosa and there were great privations and shortages of rations.

A group of 45 men in the control group, selected with vitamin A blood levels of 15 μ gm. or less, were tested for dark adaptation. Only 4 encountered difficulty with the test. This showed that severe vitamin A deficiency is necessary to interfere with the dark adaptation mechanism.

XII. A single dose of vermifuge (1 gm. hexylresorcinol) was given to one-half of nearly 1,200 troops. Two successive faecal specimens from each were examined before treatment and again after 4½ months. This dose reduced the helminthic infection rates and intensities. Many of the men lost weight during the period and this loss was directly related to the intensity of helminthiasis. No correlation was found between the incidence of clinical signs of nutritional deficiency and intestinal parasitosis.

R. Passmore

JELLIFFE, D. B., ARROYAVE, G., AGUIRRE, F., AGUIRRE, A. & SCRIMSHAW, N. S. **The Amino-Acid Composition of Certain Tropical Pulses and Cereals.** *J. Trop. Med. & Hyg.* 1956, Sept., v. 59, No. 9, 216-17.

Analyses of 21 samples are recorded. The tryptophane content of most ranged from 0.07 to 0.20 gm. per cent. Samples of *Lens esculenta* (lentil), *Eleusine coracana* (ragi) and rice gave values below this range and only soya bean was above it. The lysine content of most samples ranged from 1 to 2 gm. per cent. with only wheat, lentil, ragi and rice below and soya bean above. The usual range for methionine was 0.20 to 0.60 gm. per cent. with *Phaseolus aureus* (green gram), ragi and rice below and soya bean and *Vigna unguiculata* (cow pea) above. The usual range for cystine was 0.20 to 0.50 gm. per cent. with ragi below and soya bean above. The authors hope that these results will be useful for the development of appropriate vegetable protein mixtures. R. Passmore

DIMMETTE, R. M. **Fibrosis of the Liver of Egyptian Children and Adults.** *Amer. J. Trop. Med. & Hyg.* 1956, July, v. 5, No. 4, 703-12, 4 figs. [22 refs.]

Fibrosis of the liver, affecting both children and adults, has now widely been reported in various parts of Africa, Asia and South America. In Egypt, schistosomiasis has been held to be the prime factor in its causation; but its known occurrence in areas free from schistosomiasis suggests

that this may not be the case. The author has examined 172 such cases in Egypt over a period of 2 years, using wedge biopsy. The ages of 60 patients in the children's group ranged from 6 months to 14 years; there were 112 adults. Of the children, 7 had proven schistosomiasis and of the adults, 87. The male to female ratio in the children's group was 1.6 to 1, and that in the adult group 2.2 to 1. Nearly all the patients came from rural or suburban districts of the Nile delta, where diets are low in protein and the hygienic conditions in general are bad.

The livers of most of the 7 children with schistosomiasis (all of them with *Schistosomiasis mansoni*, and 2 with an added *S. haematobium* infection) showed excessive fibrous tissue deposition in addition to the inflammatory cell infiltration and fatty changes present in all the children; fibrous tissue deposition was seen in only 14 of the 53 children free from schistosomiasis, and then only to a minor degree. Some abrupt changes in fatty metamorphosis occurring about puberty were thought to be due to dietary changes at this time. The 53 affected children free from schistosomiasis were suffering from a variety of conditions, which are listed in a table; gross malnutrition was evident in only 10 of them.

The livers of the 87 adults with schistosomiasis also showed marked nodular or smooth fibrous deposition, and increased collagen. Fatty changes when present were slight, but usually they were absent.

The author concludes that in both children and adults malnutrition, whether sustained or interrupted, in the absence of visceral schistosomiasis is the most important aetiological factor in producing liver fibrosis in Egypt as elsewhere.

A. R. D. Adams

JONES, E. B. Some Nutrition Problems in Central Africa. *Central African J. of Med.* 1956, Feb., v. 2, No. 2, 60-72. [25 refs.]

In an industrial community in Africa, both the European and African members are forced to change their traditional dietary habits. The changes are usually for the worse. This essay elaborates this theme in a practical manner. It is to be hoped that it will be widely read in Rhodesia.

R. Passmore

HOLMES, E. G., JONES, E. R., LYLE, Margaret D. & STANIER, Margaret W. Malnutrition in African Adults. 3. Effect of Diet on Body Composition. *Brit. J. Nutrition.* 1956, v. 10, No. 3, 198-219. [32 refs.]

Attempts are described to find out the effects of malnutrition on body composition. It is suggested that adult subjects undergoing refeeding after malnutrition may have extreme variations in cell composition. The chemical composition of the cells of the body is of fundamental importance in relation to nutrition, but unfortunately can only be studied by indirect methods. The following 3 methods of approach were used.

1. The total body water was determined by the urea dilution method.

In 8 malnourished subjects it was shown that the total body water appeared high (70-87 per cent. of body weight) and fell after several weeks of refeeding to approximately normal levels (51-73 per cent. of body weight). Thiocyanate space also fell markedly in some subjects. The gain in body weight during the period of refeeding was low in comparison with the calculated gain in body solids. Thus, one subject in 51 days gained 4.6 kgm. in body weight, but lost apparently 10.5 kgm. water: it was thus calculated that he gained 15.1 kgm. of body solids. One subject, in addition to dietary therapy, received corticotrophin and cortisone and these compounds appeared to increase intracellular water. The authors are properly cautious in discussion of equating "urea space" with "total body water" in all circumstances, but indicate the possibility that the concentration of protein within the cells may have increased markedly during refeeding in these patients.

2. Balance experiments were carried out for 5 periods on 3 patients undergoing dietary therapy. In all there was a positive balance of nitrogen, sulphur and phosphorus, indicating protein synthesis. But in 2 adult patients there was a negative potassium balance. A positive nitrogen balance with a negative potassium balance is compatible with the hypothesis that the protein content of the cells was rising, while the water content was falling.

3. The composition of muscle, obtained either at operation or autopsy, was determined. There was no close correlation between the content of water, solids or proteins in the samples and the recorded nutritional state of the subject. The muscles contained less protein than has been reported by other workers on human subjects in America.

R. Passmore

NICOL, B. M. **The Nutrition of Nigerian Children, with particular reference to their Energy Requirements.** *Brit. J. Nutrition.* 1956, v. 10, No. 3, 181-97, 2 figs. [15 refs.]

The calorie intake of 4 groups of Nigerian children was determined by individual dietary surveys as follows:—

Occupation of Parents	Clan	Mean Calorie Intake	
		Age 4-6	Age 10-12
Farmers and cattlemen	Kanuri and Shuwa	1380	—
Farmers	Otukwang	910	1770
Farmers	Camerri	1110	1970
Clerks	Ibo and Yoruba	—	2730

The Otukwang children were shorter and lighter than the other 3 groups, whose physical development was similar. It is suggested that the high intake found in the Ibo and Yoruba children may have been due to high rates of energy expenditure. The calorie intake of this group was 18 per cent. above the FAO recommended allowance of 2,300 Cal./day. This

recommendation may be too low for active children between the ages of 10 and 12.

Details are given of percentage incidence of parasitic infections and of clinical examinations of the children. Staring hair and generalized xerosis were associated with a low dietary intake of vitamin A; angular stomatitis, nasolabial seborrhoea and an abnormal degree of infection in the conjunctiva were associated with a low intake of riboflavin.

R. Passmore

DU PLESSIS, D. J. **Parotid Enlargement in Malnutrition.** *South African Med. J.* 1956, July 28, v. 30, No. 30, 700-703, 14 figs. [17 refs.]

This paper reports 17 patients with parotid enlargement attributed to malnutrition. Of these, 10 had some obvious cause for the malnutrition which could be rectified by surgery (e.g., carcinoma of the oesophagus). Photographs show marked reduction in the size of the glands after a few weeks of good feeding, following surgical treatment. These photographs provide a good demonstration that the enlargement was nutritional in origin and was reversible. Histological study of the glands indicated that the enlargement was due to hypertrophy of the acinar cells and not to hyperplasia.

R. Passmore

CAMPBELL, J. A. H. **The Morbid Anatomy of Infantile Malnutrition in Cape Town.** *Arch. Dis. in Childhood.* 1956, Aug., v. 31, No. 158, 310-14, 2 figs. [14 refs.]

This paper is based on post-mortem material from 40 children who suffered clinically from malnutrition. The findings were basically similar to those reported from other parts of the world. In 37 post mortems there was some degree of fatty change in the liver and this was severe in 23. The changes of serous hepatosis were completely absent. In 28 cases there was atrophy of the acinar tissue of the pancreas which in some instances was represented virtually by bare nuclei alone. No significant changes were observed in the heart, endocrine organs or lymphoid tissues. In 31 children the lungs showed microscopic evidence of pyaemic abscess or bronchopneumonia. Although gastro-intestinal disturbances in life were common, naked-eye lesions in the bowel were uncommon.

R. Passmore

GÓMEZ, F., RAMOS GALVAN, R., FRENK, S., CRAVIOTO MUÑOZ, J., CHÁVEZ, R. & VÁZQUEZ, Judith. **Mortality in Second and Third Degree Malnutrition.** *J. Trop. Pediatrics.* London. 1956, Sept., v. 2, No. 2, 77-83, 1 fig. [16 refs.]

The authors' summary is as follows:—

"The mortality rate in 733 malnourished children hospitalized from 1949 to 1952 has been subjected to analysis. The significant influence on

mortality of the degree of malnutrition and the presence of water and mineral imbalance, diarrhoea and acute broncho-pneumopathy has been demonstrated. The existence of evident oedema or of skin lesions has no influence on mortality. The significance of these findings has been discussed."

[The authors, writing from Mexico City, recognize 3 degrees of malnutrition but they do not differentiate the varieties, or the acuteness or chronicity of the conditions. As malnutrition can exist in any percentage below (or above) the optimum in a large variety of substances, this simplification is in fact confusing. Terms such as "marblization" and "wet cloth sign" are not always understood. The importance of water and electrolyte imbalance is stressed, but there is no indication of how these were ascertained, and it was found that "evident oedema" or "skin lesions" had no influence on mortality.] *Cicely D. Williams*

BASSIR, O. Nutritional Studies on Breast Milk of Nigerian Women.

3. Variation in the Output of Milk with the Stage of Lactation.
West African Med. J. 1956, June, v. 5 (n.s.), No. 2, 88-96, 5 figs.
[19 refs.]

This paper reports the analyses of 24-hour samples of breast milk collected by manual expression from 186 women in Lagos. The results are set out only as scatter diagrams: from these it can be seen that there are great variations in the daily output (from less than 300 to over 1,000 gm.) and also in calcium output and cream content.

R. Passmore

SIMPSON, I. A. & CHOW, A. Y. The Thiamine Content of Human Milk in Malaya. Part II. The Effect of the Administration of Supplementary Thiamine on the Thiamine Level of Human Milk. *J. Trop. Pediatrics.* London. 1956, Sept., v. 2, No. 2, 69-76.

Varying doses of thiamine were given to 26 women (Malay, Chinese and Indian) in Singapore, both by mouth and subcutaneous injection. In two Malay women in whose milk thiamine was not detected at first, the level rose to only 2.5 μ gm./100 ml. of milk after receiving 9 mgm. daily for 14 days. The highest level of thiamine reached was 38.9 μ gm./100 ml. after receiving 40 mgm. a day by injection for 10 days. Some of the women and their infants had obvious signs of beriberi. In such cases it would appear necessary to give large doses of thiamine for several days before a satisfactory level in the milk is reached.

[The authors, who are biochemists, are careful to make no clinical recommendations. From the details, clearly set out in their table, it would seem that when either mother or child has evidence of beriberi, a daily injection of 20 mgm. thiamine for 5 days and thereafter 3 mgm. by mouth 3 times a day for at least a further 14 days, would be a rational

therapy. Such a therapeutic régime should lead to thiamine levels in the milk of at least 15 μ gm./100 ml. and often higher.] [For Part I, see this *Bulletin*, 1956, v. 53, 1873.]

R. Passmore

JOLLIFFE, N. & TUNG, Ta-Cheng. **Nutrition Status Survey of the Civilian Population of Formosa. Metabolism.** New York. 1956, May, v. 5, No. 3, 309-27. [24 refs.]

"From the clinical and biochemical data of the nutrition status survey of the civilian population of Formosa it is concluded that the prevalence of the several types of malnutrition in the sixth grade school children is approximately as follows: riboflavin deficiency, 70 per cent; low excretion of urinary thiamine, 55 per cent; anemia (iron deficiency), 13 per cent; vitamin A deficiency, 10 per cent; niacin deficiency, 10 per cent; hypoproteinemia, 3.2 per cent and beriberi, 0 per cent (6 per cent in adults).

"Attention is called to the close correlation of the clinical and the biochemical findings which indicate the practicality of rapid nutrition status surveys by clinical examination alone, without the necessity of obtaining simultaneous biochemical data relating to deficiencies of vitamin A, ascorbic acid, riboflavin and niacin."

VAN DER HOEVEN, J. A. **Possible Causes of the High Infant Mortality in Netherlands New-Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, Sept., v. 8, No. 3, 281-5. [17 refs.]

The high infant mortality in Netherlands New Guinea is associated with maternal malnutrition. Haemosiderosis, anaemia and disturbed levels of blood proteins in the pregnant woman give rise in the new-born infant to a low weight at birth, fatty and fibrotic liver and anaemia. Measurements of body length and body weight show that Papuan infants at birth are much smaller than European infants. R. Passmore

VAN DER HOEVEN, J. A. **Factors which influence the Chances of Life in Newborn Infants in Netherlands New Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, Sept., v. 8, No. 3, 286-92. [11 refs.]

The quantity of milk that could be expressed from the breast of nursing mothers was measured and found to be greatest in areas where the general nutrition was good. Suckling is normally continued for 2 years and this probably accounts for the low incidence of kwashiorkor. Sexual intercourse is forbidden by Papuan custom until the child is weaned. This spacing between pregnancies is of great advantage to the child.

R. Passmore

GOPALAN, C. **Protein Intake of Breast-Fed Poor Indian Infants.** *J. Trop. Pediatrics.* London. 1956, Sept., v. 2, No. 2, 89-92, 1 fig. [12 refs.]

Fourteen mothers and their infants belonging to the poorest socio-economic classes in South India were studied after admission to hospital. Milk output varied from 16 oz. to 18.2 oz. per day and the protein intake of the infants from 1.1 gm./kgm. to 2.0 gm./kgm. body weight. It is concluded that the actual requirements of protein are probably not more than 2.0 gm./kgm. in the first few weeks and probably less in later stages of lactation. The conventional method of expressing protein requirements on a body weight basis may be fallacious.

R. Passmore

NÀJERA, L. Sulla nomenclatura nosologica: a proposito della discromia pelo-cutanea edematoso (Kwashiorkor). [Nomenclature of Kwashiorkor] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1956, Oct., v. 37, No. 10, 513-18.

KHALAP, N. V. **Observations on 'Kwashiorkor' or Nutritional Dystrophy in Poona.** *Indian J. Child Health.* 1956, July, v. 5, No. 7, 306-13.

This paper describes typical kwashiorkor in Poona. There were 100 cases out of 1,460 admissions to a paediatric unit in 1955. The numbers are increasing, but whether this increase is real or attributable to increased recognition, is not stated. The author considers that the disease has become a challenging socio-economic problem, and under the circumstances it is imperative that these children and their families should be helped by the State to maintain themselves in positive nutritional status. How the State should help is not mentioned.

R. Passmore

SCRIMSHAW, N. S., BEHAR, M., ARROYAVE, G., VITERI, F. & TEJADA, C. **Characteristics of Kwashiorkor (Síndrome Pluricarencial de la Infancia).** *Federation Proc.* Wash. 1956, Sept., v. 15, No. 3, 977-85, 2 figs. [69 refs.]

" The clinical and pathological characteristics of the condition known as Síndrome Pluricarencial de la Infancia in Latin America and Kwashiorkor in most other parts of the world are briefly summarized and the presently available biochemical and physiological information regarding this syndrome is reviewed in detail.

" Data obtained from studies in Central America pertaining to aspects of the condition which have not previously been described are given as follows: neither blood levels for thiamine nor serum levels for total and 'free' riboflavin are decreased. A very poor absorption of oral vitamin A

was found in patients with Kwashiorkor on admission compared with normal absorption following five days of treatment. The results of assays for vitamin A, carotene, niacin, thiamine and riboflavin in the livers of seven fatal cases of Kwashiorkor are given. The excellent hematological response to protein therapy of the normocytic or mildly macrocytic anemia most frequently encountered is also illustrated.

"The continuous variation from classical Kwashiorkor to marasmus is stressed with the warning that many of the so-called characteristics of Kwashiorkor are also to be found in the latter."

SÉNÉCAL, J., PILLE, G., DUPIN, H., SAYERSE, C. & OSPITAL, M. T.
Étude des bilans azotés dans le kwashiorkor. [A Study of the
Nitrogen Balance in Kwashiorkor] *Bull. et Mém. École Préparatoire
Méd. Pharm. de Dakar.* 1955, v. 3, 85-90.

The English summary appended to the paper is as follows:—

"With a view to determining the most appropriate dosage of proteins in kwashiorkor, the nitrogen balance was evaluated 17 times in 6 patients, at different periods.

"These investigations proved constantly positive, showing the intestinal assimilation to be satisfactory and the possibility for the nitrogen retention to remain elevated in spite of profuse ingesta for several weeks. A certain balance, however, should be maintained in the ration and it appears that the best value for the ratio protein calories to total calories should be 25 per cent."

DAVIES, J. N. P. **Renal Lesions in Kwashiorkor.** *Amer. J. Clin. Nutrition.* 1956, Sept.-Oct., v. 4, No. 5, 539-42. [24 refs.]

The renal lesion in kwashiorkor consists of fatty changes in the cells of the convoluted tubules. This seems, in Uganda, to be a constant finding. There is little evidence, however, that this causes any significant failure of renal function.

R. Passmore

JONES, P. R. M. & DEAN, R. F. A. **The Effects of Kwashiorkor on the Development of the Bones of the Hand.** *J. Trop. Pediatrics.* London. 1956, Sept., v. 2, No. 2, 51-68, 8 figs. [27 refs.]

The X-ray appearance of the bones of the hand were studied in 53 children in Uganda, aged 11 to 30 months; the children had been admitted to hospital on account of kwashiorkor. The retardation of development was often so marked that an impairment of growth rate must have occurred many months before the acute manifestation of the disease led to the child's admission to hospital. Rickets was not found in

these children and the impaired growth can probably be attributed to insufficient protein and calcium in the diet.

R. Passmore

SPRUE

GARDNER, F. H. & SANTIAGO, E. P. **Oral Absorption Tolerance Tests in Tropical Sprue.** *Arch. Intern. Med.* 1956, Oct., v. 98, No. 4, 467-74, 4 figs. [23 refs.]

Since the introduction of liver extract striking clinical improvement has taken place in almost all patients with tropical sprue in Puerto Rico. Most also receive folic acid therapy for the control of anaemia and the gastrointestinal symptoms. The follow-up study by RODRIGUEZ-MOLINA [this *Bulletin*, 1946, v. 43, 239] over a period of 10 years has emphasized that a complete remission of the process is not possible. Despite a satisfactory haematological remission, indiscretions in diet accentuate diarrhoea.

The present study was undertaken to evaluate the oral absorption of several foodstuffs in order to determine whether progressive improvement of the small-bowel function could be correlated with the haematological response during specific therapy. Fifty-five patients were studied whose ages varied from 13 to 78 years. In view of the poor reproducibility of the oral glucose tolerance test, the absorption of D-xylose was substituted. Twenty-five grammes of this pentose were given orally in 500 ml. of water.

Two procedures to evaluate fat absorption were used:—

(1) Oral vitamin A tolerance test: 5 ml. of percomorph liver oil (300,000 I.U.) were given and fasting, 3, 5 and 7-hour samples of clotted venous blood collected. Serum levels of vitamin A were measured with the Carr-Price reaction.

(2) Butter-fat absorption: a tolerance test similar to the procedure used to evaluate blood chylomicron changes was used as outlined by FRAZER and STEWART. The results obtained were comparable to serum chylomicron counts.

All patients had good subjective response to folic acid and vitamin B12 treatment. The diarrhoea, lassitude and glossitis disappeared and weight gains were good. A haematological response was obtained. The decreased urinary excretion of D-xylose in untreated sprue patients is similar to those noted in cases of non-tropical sprue and also among those with malabsorption.

The mechanism of D-xylose absorption in the bowel is not clear. Others have observed a decline in the plasma inorganic phosphate levels

following ingestion of the pentose. The decline of plasma inorganic phosphates in studies of oral glucose absorption has been attributed to the entry of glucose into body tissues. It may be suspected that the absorption of D-xylose is associated with active metabolic process rather than with diffusion, but the continued marked impairment of D-xylose excretion suggests a permanent defect in small-bowel function, despite the adequate vitamin therapy to revert the megaloblastic bone-marrow to a normal cytological pattern.

The oral absorption of butter fat and vitamin A was decreased in all of the untreated patients. Although the mean values of butter-fat absorption improved after treatment, approximately 60 per cent. of the treated patients had "flat" curves similar to values noted before therapy. These changes suggest that butter-fat absorption may be a criterion of early improvement of bowel function. The interpretation of continued impairment of vitamin A absorption is puzzling. The presence of a continued defect in absorption demonstrated by oral tolerance tests may indicate permanent alterations in the rate of small-bowel absorption. It can therefore be concluded that the disease is associated with changes in bowel function which are not affected dramatically by prolonged folic acid or vitamin B12 therapy.

Philip Manson-Bahr

BUTTERWORTH, C. E., Jr. & PEREZ-SANTIAGO, E. **An Evaluation of Thymidine in Treatment of Tropical Sprue.** *Proc. Soc. Exper. Biol. & Med.* 1956, Aug.-Sept., v. 92, No. 4, 762-3, 1 fig.

"Injections of a potent preparation of Thymidine in doses equivalent to at least 20, 47, and 80 μ g of Vit. B₁₂ were without effect in producing hematologic improvement in patients with tropical sprue in relapse."

HAEMATOLOGY

WALKER, A. R. P. **Correction of Haematological Data for Altitude.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 509-11.

The author points out that the fact that haemoglobin concentration, haematocrit reading and red cell count rise with increase in altitude is not in dispute but that there are only few references in the standard textbooks to the exact changes which can actually be expected at the different heights above sea level. As far as haemoglobin values are concerned Fitzgerald's Law allows for a rise of 10 per cent. in haemoglobin

concentration per 100 mm. change in barometric pressure. In Witwatersrand the pressure is about 625 mm. but the haematological data obtained for haemoglobin in white adults were for men 17.7 and for women 15.3 gm./100 ml. compared with 15.8 for men and 13.9 for women at sea level. Similarly the red cell count only rose from 5.4 million to 5.6 million per cmm. in men and from 4.8 to 5.0 million in women. At a similar altitude in India values of 5.49 and 5.02 respectively were recorded for Indian adults [DAS GUPTA, this *Bulletin*, 1952, v. 49, 1149]. The same observation was made for the haematocrit where the increase was from 47 to 50 in men and from 42 to 45 in women. These changes are again much less than those required by Fitzgerald's Law, yet they are proportionately in harmony with the data given in WINTROBE's textbook for white adults at Salt Lake City [*Clinical Haematology*, 3rd Ed., 1951, London: Kimpton], which is 4,250 feet above sea level. It thus seems that haemoglobin concentrations are considerably elevated with increase in altitude though not perhaps quite as much as suggested by Fitzgerald's Law, but that the elevation in haematocrit readings and red cell count, particularly the latter, are slight. [See also this *Bulletin*, 1956, v. 53, 356.]

H. Lehmann

TASKER, P. W. G. **Studies of the Nutritional Anaemias of Malaya: the Significance of the Giant Stab Cells. As seen in the Bone Marrow of Patients suffering from Severe Nutritional Anaemia.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 460-64. [24 refs.]

The giant metamyelocyte or giant stab cell is almost invariably seen in bone-marrow smears showing megaloblastic erythropoiesis. There has been a tendency to assume a deficiency of erythropoietic maturation factors when giant stab cells were found by themselves and the bone-marrow was otherwise normoblastic. The author reviews the literature concerning the giant stab cell and presents evidence supporting a conclusion that the appearance of these cells may be a sign of early deficiency of haemopoietic factors which eventually may lead to the development of megaloblastic anaemia. He examined bone-marrow smears from 342 patients in Malaya. There were 4 groups: (1) those with grossly megaloblastic marrows (88 patients), (2) those with intermediate megaloblastic marrows (62 patients), (3) those with normoblastic marrows but possessing, like the two former groups, giant stab cells (73 patients) and lastly (4) a group with normoblastic marrows without giant stab cells (119 patients). There was no significant difference in the degree of anaemia in the 4 groups. All patients had a haemoglobin level of 6 gm./100 ml. or less. When patients from group (3) were treated with folic acid, giant stab cells disappeared or gradually diminished in number but the anaemia did not improve. However, when others from this group were given iron, there

was good improvement in the peripheral blood but only a few showed diminishing numbers of the giant stab cells.

Further evidence for the author's hypothesis came from 16 of the 192 patients who presented with normoblastic marrows and severe iron deficiency, and, unlike the rest, showed no improvement on treatment with iron. On re-examination the bone-marrow was found to have become megaloblastic. Thus a severe iron deficiency seemed to have concealed the megaloblastic element of the anaemia. Of these 16 patients, 6 showed giant stab cells and 10 did not. The author suggests that these observations show an interaction effect between the deficiencies of iron and other haemopoietic factors where the preponderance of iron deficiency tends to inhibit the development of a more characteristic megaloblastic anaemia and the action of folic acid given therapeutically.

[These investigations go far to throw light on what is one of the more obscure aspects of pathological bone-marrow changes. However there are still difficulties. Why should a folic acid deficiency, allegedly sufficient to produce giant stab cells, not prevent improvement on iron therapy alone *in every case*? The author's hypothesis may well apply to the small group of 16 patients with iron deficiency—6 of them with, and 10 without, giant stab cells. It cannot explain the presence of giant stab cells in the much larger group of patients with iron deficiency who in fact did improve on iron treatment without folic acid. These patients resemble, of course, those seen in Britain who were considered as providing evidence against the universal value of giant stab cells as indicators of folic acid deficiency.]

H. Lehmann

VINKE, B. & VAN DER SAR, A. **Megaloblastic Nutritional Anaemia in Curaçao.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, June, v. 8, No. 2, 151–63, 4 figs. [20 refs.]

During the period 1951–54 these authors observed 18 patients suffering from megaloblastic anaemia on the island of Curaçao. They explain that maize is the staple food of the indigenous population, that pellagra is common among them, their diet is deficient in protein and that kwashiorkor occurs there.

All the patients belonged to the poor group of the population and had lived on a deficient diet; sprue, amoebic and helminthic infections were excluded as causes of the anaemia. The mean cell volume was more than 92 c μ in all but one case, the mean corpuscular haemoglobin concentration was normal in only 4 patients and was below 30 per cent. in 9 patients. Serum vitamin B12 and folic acid levels were estimated in 2 patients and in both were below the normal range.

Ten patients were treated successively with ferrous sulphate, vitamin B12 and folic acid and in almost all there were satisfactory haematological responses to the ferrous sulphate and to the vitamin B12, but in only 1 was

there a response to treatment with folic acid. [In view of the fact that the patients had previously been treated with the other two substances their response to folic acid could hardly be expected.]

Six patients were treated with unspecified doses of Marmite: in 3 of these the haematological response was considered to be optimal, in 2 sub-optimal and in 1 there was no response.

Three patients were treated with daily intramuscular injections of 3 mgm. Leucovorin (citrovorum factor, Lederle). This dosage was considered to be sub-optimal but was followed in all 3 patients by a satisfactory haematological response.

The authors conclude by speculating on the mechanisms whereby the anaemias could have been produced. They suggest that in the case of pregnant women, the body reserves of haemopoietic substances, if high at the commencement of pregnancy—and this they probably are not in most women in the tropics—may do much to prevent the development of anaemia even if the diet should be inadequate for the demands of pregnancy.

A. W. Woodruff

MIDDLEBROOK, J. E. **Thalassemia in a Family of Pure German Extraction.** *New England J. of Med.* 1956, Oct. 25, v. 255, No. 17, 815-17, 3 figs.

“A family of pure German extraction carrying the trait for thalassemia in three generations is described. This disease is rare in non-Mediterranean races.”

MECHALI, D., SEGUIN, F., PLISSION, M., DE LA VAISSIERE, C. & MOULINE, A. Premier cas de thalassémie majeure chez le Marocain musulman. [First Case of Thalassaemia Major in a Moroccan Muslim] *Bull. Inst. Hyg. Maroc.* 1955, v. 15, Nos. 1/2, 163-7, 1 fig.

NORRIS, J. E., HANSON, H. H. & LOEFFLER, R. K. **Mediterranean Anemia in an Adult Negro.** *Arch. Intern. Med.* 1956, Sept., v. 98, No. 3, 356-64, 2 figs. [18 refs.]

“The case of an adult Negro with proved Mediterranean anemia is presented. The fact that no race or age is exempted from this malady has been reemphasized. The variability of the disease is commented on.

“That a family study and hemoglobin analysis are essential in establishing the diagnosis is stressed. The fact that Mediterranean anemia is primarily a defect in hemoglobin synthesis and red cell production and not a hemolytic process interrupted by crises is emphasized.”

HOFFMAN, J. F., WOLMAN, I. J., HILLIER, J. & PARPART, A. K. **Ultra-structure of Erythrocyte Membranes in Thalassemia Major and Minor.** *Blood.* 1956, Oct., v. 11, No. 10, 946-56, 14 figs. on 5 pls. [12 refs.]

"The plasma membranes of erythrocytes derived from Thalassemia major (five cases) and minor (seven cases) were isolated and studied by electron microscopy. It was found that the surface texture of ghosts from all T. minor bloods appeared similar and indistinguishable from ghosts of normal human blood. The surface texture of ghosts from all T. major bloods likewise were quite similar but distinctly different from T. minor and normal ghosts. These differences were observable whether the specimens for comparison were prepared at the same time or on different days. The results indicate that the morphological characteristics observed in T. major ghosts constitute an expression of an alteration in the molecular structure of their plasma membranes."

MECHALI, D., PLISSIER, M. & DE LA VAISSIERE, C. Premier cas d'anémie drépanocytaire. [First Case of Sickle-Cell Anaemia in Morocco] *Bull. Inst. Hyg. Maroc.* 1955, v. 15, Nos. 1/2, 155-61, 2 figs. [18 refs.]

TORREALBA, J. F., VÁZQUEZ, A. D., RODRÍGUEZ, I. R., GONZÁLEZ, D. & TORREALBA, Ana I. Algunas consideraciones sobre la enfermedad de hematíes falciformes en Venezuela. [Observations on Sickle-Cell Disease in Venezuela] *Mem. Inst. Oswaldo Cruz.* 1955, June-Sept.-Dec., v. 53, Nos. 2, 3 & 4, 509-17, 4 figs. [12 refs.]

The authors describe in detail a case of sickle-cell anaemia in a boy of 7 years in Venezuela. The sickle-cell trait was found in both of his parents and in his brother, aged 10 months.

A survey of the local population revealed an additional 3 cases of the sickle-cell trait, all in children of one family, out of 154 persons examined.

H. J. O'D. Burke-Gaffney

GAC. MÉD. DE CARACAS. 1956, Jan.-Feb., v. 63, Nos. 1/2, 41-73, 5 figs. [18 refs.] German summary. Algunas consideraciones sobre la enfermedad de hematíes falciformes en Venezuela. [Observations on Sickle-Cell Disease in Venezuela] [TORREALBA, J. F., VÁZQUEZ, A. D., RODRÍGUEZ, I. R., GONZÁLEZ, D. & TORREALBA, Isabel]. 41-52. II. Algunas consideraciones sobre la enfermedad de hematíes falciformes o enfermedad de Herrick en Venezuela (Addendum) [Further

Observations on Sickle-Cell Disease in Venezuela] [TORREALBA, J. F., with the collaboration of I. RAMOS, F. R. MARROQUIN, D. GONZÁLEZ, A. D. VÁZQUEZ, G. P. OSÍO, J. A. ACOSTA & I. R. RODRÍGUEZ]. 53-73.

The first paper deals with the same material as that referred to above. The second includes references to previous studies in sicklaemia in Venezuela and other parts of South America, together with additional information on the patient referred to above. The authors also discuss new material. They have now found 15 additional cases of sickling, making 22 out of a total of 233 persons examined. Of these 15, 2 had a haemolytic anaemia and 3 acute abdominal conditions. Thus of the 233 persons studied there were 9.4 per cent. of sicklers, of whom 6 persons suffered from pathological conditions.

H. J. O'D. Burke-Gaffney

See also p. 119, WALTERS & BRUCE-CHWATT, **Sickle-Cell Anaemia and falciparum Malaria**.

ALLISON, A. C. **The Sickle-Cell and Haemoglobin C Genes in some African Populations.** *Ann. Human Genetics.* 1956, July, v. 21, Pt. 1, 67-89, 1 fig. [Numerous refs.]

This paper records the presence or absence of sickling and the electrophoretic appearance of abnormal haemoglobins in more than 4,000 people belonging to 7 populations: from the district of Musoma, Tanganyika, the Central and Western Divisions of the Gambia, from the Gold Coast, Sierra Leone, and Nigeria. In Tanganyika and in the Gambia infants and adults were examined, in the other territories adults only. With a single exception where in the Gambia a "fast moving" haemoglobin component was observed, only haemoglobins A, S and C were discovered. No haemoglobin C was discovered in Tanganyika, but numerous instances were found in West Africa, where the highest frequencies were seen in the Gold Coast (higher there in the North than in the South), lower frequencies were found in Nigeria and in Sierra Leone, and still lower frequencies in the Gambia. This situation represents what J. S. HUXLEY has called a polymorph ratio cline. The simultaneous presence of the abnormal haemoglobins C and S gives rise to a situation where 2 of the 3 heterozygotes are at an advantage—the AS and the AC heterozygotes—and where compared with these two the SC heterozygotes and the 3 homozygotes (AA, CC and SS) all are at a disadvantage.

In addition to an examination of the distribution of haemoglobin C the paper is concerned with the viability of sickle-cell homozygotes and with the fitness of the sickle-cell heterozygotes. Sickle-cell homozygotes appear in the infant population in frequencies close to those expected; but the author estimates that only 14 per cent. of sickle-cell homozygotes

survive to adulthood. What proportion of these actually reproduce is a matter of conjecture, and females might be expected to fare rather worse than males in that respect, because sickle-cell anaemia is complicated by pregnancy. The author discusses the evidence for and against the effect of heterosis—*i.e.* an advantage of the sickle-cell heterozygotes over both normal and sickle-cell homozygotes as an explanation for the high frequency of sickling in some populations. This particular paper does not deal with malaria as the possible selective agent except by way of discussion. It provides more independent evidence for heterosis by comparing the frequency of heterozygotes in infants and adults. In Musoma, Tanganyika, 386 parents and 287 infants were examined and the frequency of sickle-cell heterozygotes was 38 per cent. in the adult population and 31 per cent. in the infant population. This difference can only be explained by a higher mortality among children of both types of homozygotes compared with that of the sickle-cell heterozygotes.

H. Lehmann

WALTERS, J. H. & LEHMANN, H. **Distribution of the S and C Haemoglobin Variants in Two Nigerian Communities.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 204-8. [30 refs.]

Haemoglobins S and C are important as possible causes of ill health and their presence is genetically determined. Thus variations in their frequency may be explicable on an ethnological basis but such explanations are frustrated in West Africa by a deficiency of written records. The genetic make-up of a tribe as revealed by the frequency of these haemoglobins assists in evaluating ethnological supposition, and for this reason as well as for the assessment of the importance of haemoglobins on health it is important that their frequency should be known in different peoples and tribes. A study was therefore undertaken among the Igalla and Yoruba tribes of Nigeria.

Blood obtained by venepuncture was kept in cold storage and sent by air to London. By random sampling 155 specimens were obtained from the Igalla. From the Yoruba community 940 specimens were taken representing one from each member of a Yoruba village situated near Lagos.

Of the Igalla 18 per cent. proved to be heterozygotes for the genes responsible for haemoglobins A and S; haemoglobin C was not detected in any case. Among the Yoruba 25 per cent. were heterozygotes for haemoglobins A and S and 7 per cent. carried the gene responsible for inheritance of haemoglobin C.

The Igalla are a backward race living in that part of the country between the Niger to the West and the Benue to the North. The village from which the samples from the Yoruba tribe were obtained is situated only 400 miles from the Igalla country and the territory between the two is not impassable. Nevertheless marked differences in the genetic

make-up of the 2 communities exist in that haemoglobin C is absent from the Igalla and present in 7 per cent. of the Yorubas tested. This pattern fits in with what appears to be a decreasing frequency of the gene responsible for haemoglobin C along a line from the Gold Coast eastwards. In some tribes of the Gold Coast it reaches a frequency of more than 10 per cent., decreases to 3·6 per cent. in the Yorubas of Western Nigeria and is not found in the Igalla of Eastern Nigeria.

Tradition maintains that the Igalla and the Yorubas have a common origin and if this is so the difference in frequency of haemoglobin C suggests that the gene responsible for this haemoglobin has been introduced from the West, probably from tribes inhabiting the North of the Gold Coast.

[Knowledge of the various human haemoglobins is rapidly increasing but their pathological and ethnological importance remain to be assessed. Carefully carried out studies of this kind are of great value in helping to make these assessments.]

A. W. Woodruff

CHERNOFF, A. I., with the technical assistance of Pauline C. FARR. **On the Prevalence of Hemoglobin D in the American Negro.** *Blood.* 1956, Oct., v. 11, No. 10, 907-9, 1 fig. [11 refs.]

The following is a translation of the author's summary, which is given in Interlingua:—

In a study of 1,000 Negroes of the west central area of the United States, 4 were found who were heterozygous for haemoglobin D. Investigation of their families resulted in the discovery of 4 more cases of carriers heterozygous for haemoglobin D and one case of a person homozygous for haemoglobin D. Haemoglobin D has now been recorded in Negroes, Caucasians, Algerians and Indians. Its racial distribution is wider than that of all the other abnormal haemoglobins.

H. J. O'D. Burke-Gaffney

LEHMANN, H. & SINGH, R. B. **Haemoglobin E in Malaya.** [Correspondence.] *Nature.* 1956, Sept. 29, v. 178, 695-6.

Haemoglobin E occurs in Siamese, Burmese and Indonesians [see, for example, this *Bulletin*, 1955, v. 52, 1227; 1956, v. 53, 1047, 1376] and the authors were concerned to see whether Malaysians were similar in this respect to the Burmese and Siamese neighbours in the north (15·3 and 13·6 per cent.) or to Indonesians in the south (2·9 per cent.). They examined the blood of 346 non-related Malaysians and found that 24 showed haemoglobins A and E, 1 haemoglobin F and E, and 1 haemoglobin E only. The results are shown in a table which indicates that the Malaysians, with an incidence of 7·3 per cent., are somewhat midway between their northern and southern neighbours.

The table also suggests a gradient in Malaya itself. The peninsula is divided into eastern and western areas by mountains and most of the migrants from Indonesia have settled in the south, west of the mountains. There seems to be an inverse relationship between past Indonesian admixture and incidence of haemoglobin E; it was found only once among 54 people from southern parts of the Western States of Malaya, namely Negri Sembilan, Malacca and Johore. The percentage findings of haemoglobin E were Eastern States, 13.1; Western States, north, 6.0; Western States, central, 5.2; South, 0.

In one person from Kelantan, part of the haemoglobin was neither A, F nor E and had properties suggestive of haemoglobin H [*ibid.*, 1956, v. 53, 649].

It is hoped that the survey will be extended. Already it would seem that the distribution of haemoglobin E in Malaya follows an ethnological pattern as was noted for other haemoglobins in Africa [*ibid.*, 1950, v. 47, 267; 1956, v. 53, 1045].

H. J. O'D. Burke-Gaffney

MOTULSKY, A. G. **Genetic and Haematological Significance of Haemoglobin H.** [Correspondence.] *Nature.* 1956, Nov. 10, v. 178, 1055-6.

There has been good evidence for an inheritance on simple Mendelian lines of all haemoglobin variants which have so far been investigated by family study (except, of course, haemoglobin F which is not a variant of haemoglobin A and the production of which is under independent genetic control). In the case of haemoglobin H, however, no one has so far been able to discover the abnormal pigment in the parents of the various propositi. On the other hand, at least one parent had the thalassaemia trait without haemoglobin H, and haematological studies of the propositi suggested that in addition to haemoglobin H a gene for thalassaemia was present. It would thus seem that haemoglobin H does not become apparent in the phenotype unless haemoglobin A formation is impeded by a thalassaemia gene. Multiple allelism between thalassaemia and haemoglobin H seems to be excluded, because in one case a son of a patient with haemoglobin H-thalassaemia also showed this condition (GOUTTAS *et al.*, *Sang*, 1955, v. 26, 911). The author himself has extended his survey of Filipinos in whom he had found two instances in 1954 [*Blood*, 1954, v. 9, 897; this *Bulletin*, 1954, v. 51, (1286)]. A further 73 examined did not show the abnormal haemoglobin.

H. Lehmann

VENOMS AND ANTIVENENES

HAAST, W. E. & WINER, M. L. Complete and Spontaneous Recovery from the Bite of a Blue Krait Snake (*Bungarus caeruleus*). *Amer. J. Trop. Med. & Hyg.* 1955, Nov., v. 4, No. 6, 1135-7.

The patient is the Director of a serpentarium in Miami, Florida. He was, at the time of the bite, engaged in immunizing himself, first with *Naja flava* venom in progressive doses and later with venom from the African Cape cobra, the Indian cobra and King cobra (last intradermal injection before the krait bite was 3 mgm. of each toxin). In addition to these scheduled injections he had had accidental natural injections from Cape, Egyptian and Indian cobras, a rattlesnake and a moccasin. No specific therapy was given for any of these bites except the last.

He was eventually bitten on the dorsal surface of the right hand by a blue krait from which he was attempting to obtain venom. He states that one fang entered a vein and the other embedded itself in soft tissues. He went on with his work. Half an hour after the bite he felt euphoric. Soon afterwards he began to take notes of his condition which were finally completed by his wife up to the following morning on admission to hospital. His activities during the evening of the bite included driving a car about 15 miles each way to keep an appointment. The diary at this point reads:—

“ 9.00 p.m. Much more difficult to walk straight—I walk as if I were drunk. Chest and stomach cramps very severe. (When driving home patient had severe ptosis of eyelids.) Can't keep eyes open. Must use only one eye in order to see correctly. Every muscle in my body aches. Pins and needles sensation on soles of feet. Throat very sore, teeth hurt, back of tongue is numb. My speech and thought processes do not seem to be affected.

“ 9.45 p.m. Arrived home—it is very difficult to walk—feel nauseated. (Patient vomited a few moments later.) ”

Among other things he noted that radio and other sounds were magnified and colours more brilliant.

On examination the neurological picture was as he described himself. Physical examination revealed nothing else. He was given intravenous glucose while he could not swallow. He recovered by the third day. Next day he resumed his work of extracting venoms.

The authors point out that this remarkable story suggests the possibility of cross protection between *Bungarus* venom and the other venoms, especially those of the cobras mentioned. Further investigations might be made into the important possibility of producing a common antivenene [presumably by other methods?].

[As a motorist, the abstracter is more determined than ever to avoid being bitten by a krait.]

B. G. Maegraith

TURNER, J. C., with the technical assistance of E. ANN PEARSON. **On the Relation of White Blood Cells and Platelets to Venom Hemolysis.** *J. Exper. Med.* 1956, Oct. 1, v. 104, No. 4, 517-23, 2 figs. [20 refs.]

SAGGESE, S. Su di un nuovo caso mortale da puntura di *Vespa crabro*. [A New Fatal Case of Biting by the Wasp *Vespa crabro*] *Nuovi Ann. d'Igiene e Microbiol.* 1956, July-Aug., v. 7, No. 4, 306-8, 1 coloured fig. on pl.

The English summary appended to the paper is as follows:—

“The death of a farm-labourer 33 years old occurred in the zone of Campobasso from the bites of three Hymenoptera (*Vespa crabro*) is reported. Other two severe but not deadly cases from bites of the same wasp likewise observed in Molise are mentioned.”

BETTINI, S. & CALCARA, S. Terapia del morso di *Latrodectus tredecimguttatus* Rossi. Sul primo caso di latrodetismo trattato con siero immune in Italia. [Treatment of *Latrodectus tredecimguttatus* Bite. First Case in Italy of Latrodetism treated with Immune Serum] *Riv. di Parassit.* Rome. 1956, July, v. 17, No. 3, 186-9. [17 refs.]

TOXOPLASMOSIS

WEINMAN, D. & CHANDLER, Anne H. **Toxoplasmosis in Man and Swine—an Investigation of the Possible Relationship.** *J. Amer. Med. Ass.* 1956, May 19, v. 161, No. 3, 229-32, 2 figs. [10 refs.]

The incidence of *Toxoplasma* infection in North American adults between the ages of 40 and 60 years is stated to lie between 30 and 70 per cent., and the authors have considered the possibility that this high rate of infection might be the result of eating undercooked pork. It was thought that pigs might have contracted toxoplasmosis by eating swine offal or infected rodents. It was shown serologically that pigs could acquire the infection in such a way.

Consumers of underdone pork are biologically marked by the presence of *Trichinella* antibodies. There should be, therefore, a positive correlation between the incidence of antibodies in the 2 infections if *Toxoplasma* is really acquired by eating underdone pork. Actually in 40 specimens of trichinous serum 23 per cent. gave a positive *Toxoplasma* dye test with a titre of 1 in 64 or more. The expected rate in the normal population is said to be between 6 and 16 per cent. at this titre, which constitutes

a statistically significant difference. Of 88 sera from hogs in New Haven, Connecticut, 42 had a titre of 1 in 64 or more in the dye test. *Toxoplasma* can survive in pork for at least 10 days at a temperature of 2°–5°C., so refrigerated pork is theoretically infective. It was also shown by feeding infective material to rhesus monkeys that infection *per os* is possible; the organisms remain viable after 4 hours' contact with gastric juice.

[All the above work was based on serological evidence alone. Pigs are well known to be carriers of *Sarcocystis*, and this infection has been shown by AWAD and LAINSON (see this *Bulletin*, 1955, v. 52, 84) and others to produce positive dye tests, and such findings may invalidate many of the authors' conclusions.]

P. C. C. Garnham

VARELA, G. Toxoplasmosis en la República Mexicana. [**Toxoplasmosis in Mexico**] Reprinted from *An. Soc. Mexicana de Oftalmología*. 1955, Oct.–Dec., v. 28, No. 4, 227–39. [Numerous refs.]

The author carried out skin tests with toxoplasmin on 976 persons in Mexico, 13 per cent. of whom reacted positively. With the dye test, positive reactions were obtained in 37.5 per cent. of 104 children and in 26.7 per cent. of 740 adults; this test confirmed the results of the toxoplasmin reaction in 93 per cent. of cases. A strain of *Toxoplasma*, isolated from man, killed mice in 4–5 days. The dye test also revealed toxoplasmosis in 15.9–34.6 per cent. of 630 wild rats (*Rattus norvegicus*) examined. Experimental toxoplasmosis in mice was treated with pyrimethamine [dosage not stated] in some cases and this was said to be more effective than tetracycline [this *Bulletin*, 1955, v. 52, 296].

C. A. Hoare

VARELA, G., ROCH, E. & PALENCIA, L. Encuesta serológica de toxoplasmosis practicada entre los indios Guambias de Colombia. [**Serological Survey of Toxoplasmosis in Guambian Indians in Colombia**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, Mar., v. 16, No. 1, 51–5, 1 map. [26 refs.]

The English summary appended to the paper is as follows:—

“Two hundred and ninety seven blood sera from ‘guambian’ Indians of Colombia gave 29.6% positive result with the dye test for toxoplasmosis. Of 275 blood sera from the same Indians 9 gave low agglutination titers with Proteus X-19-0.”

MORRIS, J. A., AULISIO, C. G. & McCOWN, J. M. **Serological Evidence of Toxoplasmosis in Animals.** *J. Infect. Dis.* 1956, Jan.–Feb., v. 98, No. 1, 52–4. [12 refs.]

The investigation described in this paper was undertaken in order to determine the incidence of toxoplasmosis in American animals, as

possible reservoirs of human infection. For this purpose sera obtained in the Middle Atlantic areas of U.S.A. from 426 animals, comprising 180 dogs, 107 rabbits and smaller numbers (3 to 64) of other animals (cats, foxes, marmots, opossums, pigeons, raccoons, rats and squirrels) were tested by the complement-fixation reaction, for which antigens prepared from toxoplasm-infected chorioallantoic membranes of chick embryos or from allantoic fluid of embryonated eggs were used. Toxoplasmic antibody was detected in 45 (25 per cent.) dogs and in 20 (19 per cent.) rabbits with significant titres, ranging from 1 in 8 to 1 in 128. However, the results with all the other animals were negative; furthermore, it was not possible to isolate *Toxoplasma* from the tissues of 2 dogs with a high titre. Complement-fixing antibody against this parasite was found to be present in the serum of 1 of 9 men who handled dogs professionally, but was absent in the sera of 38 men not thus occupied. *C. A. Hoare*

SMITH, H. C. **Toxoplasmosis in a Cat.** *J. Amer. Vet. Med. Ass.* 1956, Nov. 1, v. 129, No. 9, 430-32, 1 fig. [25 refs.]

ZUCKERMAN, A. [Toxoplasma sp. in the Sparrow, *Passer domesticus*] *Harefuah*. Jerusalem. 1956, Sept. 16, v. 51, No. 6 [in Hebrew 128, 1 fig. English summary 128].

The English summary appended to the paper is as follows:—

“ The genus *Toxoplasma*, of world-wide distribution, parasitises numerous birds and mammals. All known *Toxoplasmas* are morphologically identical and probably constitute a single species. The method of their transmission and their role as pathogens in Israel are not yet known.

“ *Toxoplasmas* have hitherto been observed in Israel in pigeons in the Tel Aviv area, and in a monkey (*Saimiri sciurea*) dying of toxoplasmosis at the Tel Aviv Zoo. Among 23 sparrows collected in Jerusalem in May and June, 1956, 3 were infected with *Toxoplasma* sp.

“ In view of the fact that children are being currently employed to destroy sparrows, which are agricultural pests and since toxoplasmosis is an increasingly serious disease the younger the patient, the fact that *Toxoplasma* is present in the local sparrow population is being placed on record.”

BALDUCCI, D. & TYRRELL, D. **Quantitative Studies of *Toxoplasma gondii* in Culture of Trypsin-Dispersed Mammalian Cells.** *Brit. J. Exper. Path.* 1956, Apr., v. 37, No. 2, 168-75, 6 figs. on pl. & 1 text fig. [16 refs.]

The authors describe the cultivation of *Toxoplasma* in trypsin-dispersed cells of rabbit and monkey kidney and human epidermoid carcinoma

(HeLa), grown in bottles or rolled test tubes at 35–36°C. in media consisting of serum (calf or horse), lactalbumin hydrolysate and Hanks's solution. When a single layer of epithelial cells developed in culture the medium was inoculated with 0·1 ml. of 1 in 10 dilution of peritoneal exudate from an infected mouse. After 1 to 2 days the examination of fresh and stained cultures showed progressive invasion by toxoplasms of the cells, which were gradually destroyed by necrosis, with the release of free toxoplasms. By treating diluted peritoneal exudate from infected mice in such a way as to destroy or filter out the parasites, and then inoculating 10-fold dilutions of the material in the tissue cultures, it was demonstrated that no degenerative changes were produced in the latter. Hence it is concluded that these changes were not produced by a toxin but by the intact parasites.

In order to determine the rate of multiplication and length of survival of toxoplasms in cultures of rabbit kidney cells, known numbers of parasites (counted in a haemocytometer) were inoculated, and the medium was changed twice weekly. The results are shown in graphs, from which it is seen that a large inoculum (2×10^6 parasites) caused rapid destruction of cells in 7 days, with numerous free parasites in the medium, while with a small inoculum (2,000 parasites) the increase of parasites and destruction of cells occurred later. When incubated at 36°C., the parasites in culture remained infective to mice for 6 to 7 weeks, but after storage at 4°C. their infectivity was lost after 5 weeks.

When the fluid phase of tissue cultures contained upwards of 300,000 parasites per ml., it produced complement fixation with immune serum when tested by a micro-method on Perspex slides. For the production of antigens, the fluid was frozen and thawed alternately 6 times, or heated at 56°C. for 30 min., after which it was clarified by centrifugation and stored at +4°C. or -26°C.

Morphologically the parasites conformed to the type seen in other host cells.

C. A. Hoare

EYLES, D. E., COLEMAN, NELL & CAVANAUGH, D. J. **Preservation of *Toxoplasma gondii* by Freezing.** *J. Parasitology.* 1956, Aug., v. 42, No. 4, 408–13, 1 fig.

Maintenance of multiple strains of *Toxoplasma gondii* by repeated animal passage is both time-consuming and liable to cause changes in the organism; preservation by storage under deep freeze conditions offers a useful alternative. The following technique proved satisfactory:—

Peritoneal exudate from mice infected with *Toxoplasma* is diluted 1:5 with serum saline, and the mixture is placed in quantities of 1 cc. in thin walled glass ampoules. One cc. of 10 per cent. glycerol in normal saline is added to each ampoule which is then sealed.

The ampoules are put into a test-tube basket lined with a one inch layer of cotton wool, and slowly frozen in the dry ice compartment of the mechanical freezer. The temperature of the contents of the ampoules drops to -14°C . after about one hour and to -41°C . after about 3 hours. After 48 hours the ampoules are removed and placed in the dry ice-alcohol freezing mixture in a Dewar flask.

The contents are thawed by immersion in a 37°C . water bath, and when fluid are ready for inoculation.

The organisms survive for at least 209 days under these conditions. The secret of successful preservation lies in (a) the slowness of the freezing, (b) the very low temperature of storage and (c) the addition of an optimal quantity of glycerol (greater amounts being much less suitable). These factors were all carefully studied and this method will doubtless be employed extensively wherever *Toxoplasma* strains are being maintained.

P. C. C. Garnham

SIMITCH, T., PETROVITCH, Z. & BORDJOCHKI, A. *Citellus citellus* animal de choix pour l'étude biologique et l'isolement de *Toxoplasma gondii*. [Citellus citellus, an Animal of Choice for the Study of the Biology and for Isolation of Toxoplasma gondii] *Arch. Inst. Pasteur d'Algérie*. 1956, Mar., v. 34, No. 1, 93-9.

The authors point out that none of the laboratory animals—including mice—are sufficiently susceptible to infection with *Toxoplasma* to be used for the detection of latent toxoplasmosis. Having isolated a new strain of *Toxoplasma* from a dog in Nish (southern Serbia) by inoculation of its spleen tissue into a souslik, *Citellus citellus*, the authors have maintained this strain by passages through this rodent, which they regard as the most suitable animal for the isolation and study of toxoplasms. Sousliks can be easily infected not only by the intraperitoneal and subcutaneous routes, but also by oral, nasal and ocular inoculation. The duration of the infection varies, with death ensuing in from 5 to 13 days. The organs most commonly parasitized are the spleen and liver, with the brain and lungs occupying the second place. Parasites have been recovered from the peripheral blood and from the urinary bladder, but they have not been detected in the intestinal wall or in the faeces.

Tests on viability have shown that the toxoplasms do not survive more than 10 minutes in water, but in saline their life is prolonged to 24 hours. In smears on glass slides exposed to desiccation they can live for 3 hours at room temperature and for 1 hour at 37°C . In the carcasses of sousliks which died of toxoplasmosis the parasites remained alive over 2 days at room temperature and over 4 days at 4°C . In infected spleen kept in saline at 4°C . they survived during the same period. C. A. Hoare

VERMEIL, C. Contribution à l'étude immunologique du toxoplasme de *Ctenodactylus gundi*. [Contribution to the Immunology of Toxoplasma in *Ctenodactylus gundi*] *Arch. Inst. Pasteur de Tunis.* 1956, June, v. 33, No. 2, 181-7. [13 refs.]

A strain of *Toxoplasma* was isolated from a gundi in Tunisia (where the parasite was originally discovered by NICOLLE) in August, 1954. The immunological properties of this strain were compared with those of the RH strain, first by the complement-fixation test which gave similar results under all combinations of homologous and heterologous sera or antigens; second by the skin test in rabbits which gave equivocal results; and third by challenging animals preimmune by inoculation of pseudocysts against one strain with the "vegetative" forms, with the following results. Three mice preimmune against the RH strain died 16, 18 and 22 days respectively after challenge with the homologous strain; 7 mice preimmune against the gundi strain died between 8 and 16 days after challenge with the RH strain; 3 mice preimmune against a gundi strain all survived after challenge with the homologous strain. Death in ordinary mice occurred 4 to 6 days after inoculation with either strain. These results indicate the close degree of relationship between these 2 strains.

The complement-fixation test was done on the sera of gundis soon after capture and then monthly. Among 9 caught in August, all gave a negative reaction at first, but 4 became positive 2 or 3 months later, and 2 animals died of the disease itself; while among 9 others caught in December, one gave a positive reaction soon after capture, but its organs contained no parasites, and the reaction (like some of the preceding ones) may have been non-specific.

P. C. C. Garnham

CUTCHINS, E. C. & WARREN, J. Immunity Patterns in the Guinea Pig following Toxoplasma Infection and Vaccination with killed Toxoplasma. *Amer. J. Trop. Med. & Hyg.* 1956, Mar., v. 5, No. 2, 197-209.

In order to study the relation between the complement-fixing and dye test antibodies in toxoplasmosis, the authors carried out experiments in which guineapigs were inoculated with 3 kinds of vaccines prepared from strain RH: type I was made by adding formaldehyde to suspensions of washed toxoplasms, obtained from the peritoneal exudate of infected mice; type II contained parasites which were ruptured by sonic vibration, and type III was represented by supernatant fluid resulting from centrifugation of toxoplasm suspension fragmented by sonic vibration. In some experiments Freund's adjuvant was added in equal parts to the vaccine. Antigens were either of the embryonated egg type or of the soluble type (prepared as in type III vaccine). The vaccinated and control animals were challenged by intradermal inoculation of the peritoneal exudate of mice infected with RH strain.

The results were as follows. In guineapigs inoculated with small doses of living parasites or treated with sulphadiazine, complement-fixing antibodies appeared after 3 weeks, with titres of 1 in 64 or higher, and persisted for about 1 year. Such animals were immune to re-infection. However, the reaction to the dye test appeared much earlier, reaching levels of 1 in 2,048 by the 14th day. A single dose of type I vaccine protected guineapigs from infection 4 weeks later, but, whereas the dye test antibody made its appearance as early as in active infection, complement-fixing antibodies were either absent or of a low titre (maximum 1 in 16). When adjuvant was added to type I vaccine, not only was there a high titre to dye test, but complement-fixing antibodies, with titres as high as or higher than in active infections, were present within 14 days. Type II vaccine, used alone or with adjuvant, produced the same results as in the corresponding tests with type I. As regards type III vaccine (with or without adjuvant), it failed to produce any appreciable complement fixation, showing that the soluble antigen preparation had a lower content of immunogenic material than all the other vaccines.

A comparison was made of the effect of different types of vaccination and sites of challenge on antibody formation and guineapig resistance. For this purpose one group of animals were inoculated with living toxoplasms, one subcutaneously with killed parasites, and another in a similar way but with adjuvant. Convalescent animals of the first group and all the others were bled and challenged with toxoplasms by different routes. Animals of the 1st group developed complement-fixing antibodies in 4 weeks, and resisted re-infection by intracerebral, intradermal and intraperitoneal routes, whereas those of the other groups remained fully susceptible to intracerebral inoculation, in spite of the presence of high levels of complement-fixing antibodies. Further observations have shown that toxoplasms are disseminated in the body of the guineapig even in the presence of such antibodies, presumably in the form of pseudocysts resistant to the latter.

C. A. Hoare

DERMATOLOGY AND FUNGUS DISEASES

HALDE, C. & RINGROSE, E. J. **Mycetoma originating in Northern California. Disease caused by a Fungus resembling Nocardia madurae.** *Arch. Dermat.* 1956, July, v. 74, No. 1, 80-85, 6 figs.

"A fungus resembling *Nocardia madurae* was isolated from a mycetoma of the right foot of a patient residing in northern California. Infection had been present for 10 years prior to diagnosis and isolation of the fungus. Although the fungus can be isolated one year after the institution of sulfonamide therapy, there has been considerable improvement in the

clinical findings. Had the patient been more cooperative in maintaining her treatment, her cure might have been obtained. The importance of finding granules in the exudate and using them for inoculating culture media is stressed both for preliminary diagnosis and identification of the infecting fungus."

FRIEDMAN, Lorraine, SMITH, C. E., PAPPAGIANIS, D. & BERMAN, R. J.

Survival of *Coccidioides immitis* under Controlled Conditions of Temperature and Humidity. *Amer. J. Pub. Health.* 1956, Oct.,

v. 46, No. 10, 1317-24, 1 fig. [18 refs.]

The areas of endemic coccidioidomycosis are characterized by arid country in which a short rainy period is followed by a dry and dusty season, and the influence of these factors on the epidemiology of the disease has been discussed by SMITH *et al.* [this *Bulletin*, 1947, v. 44, 537]. However, similar topographical and climatic conditions also prevail in areas in which *Coccidioides immitis* has not become established, and some such localities are not far from the endemic areas. There is therefore need for further studies on the ecology of the fungus, and, in this connexion, the authors have investigated the influence of atmospheric temperature and humidity on the survival of the saprophytic spores of *C. immitis* from culture.

Preliminary tests showed that exposure of the dry spores to a constant temperature of 50°C. for 7 days caused a steep fall in viability, and after 14 days at this temperature, few spores remained alive, whatever the atmospheric humidity. Exposure of the dry spores to temperatures of -15°C., 4°C., 20-25°C. (room temperature), and 37°C. at various degrees of relative humidity, showed that, under constant conditions, there was little loss of viability at the lower 3 temperatures, even after 6 months, irrespective of the atmospheric humidity. At 37°C. however, although there was a reduction of only about 50 per cent. in viable cells after 6 months with the relative humidity at 95 per cent., when the relative humidity was only 10 per cent. the loss in viability, at this temperature, was as great in one month as in 6 months with the humidity at 95 per cent.

Spores which had been stored a long time at 20-25°C. and 50 per cent. humidity did not suffer an immediate fall in viability when transferred for a short time to -15°C. but they were weakened so that the period of their survival when they were restored to 20-25°C. was shortened.

In isotonic saline or in brine, at 4°C. and at 20-25°C. the spores survived, almost without loss, for an indefinitely long time. At -15°C., however, there was a heavy loss in viability, and at 37°C., despite some germination and mycelial growth, the viability rate fell, particularly in the brine, after the first month.

The combination of a relatively high temperature (37°C.) and low humidity (10 per cent.), when constant, was inimical to the survival of

the spores, but, under natural conditions in the endemic areas, such a combination would not only be merely seasonal, but diurnal, the temperature falling and the humidity rising at night.

From these studies, the authors conclude that "these are spores well adapted to survive the environmental rigors of their arid habitat".

J. T. Duncan

TRIMBLE, J. R. & DOUCETTE, Jeanne. **Primary Cutaneous Coccidioidomycosis. Report of a Case of a Laboratory Infection.** *Arch. Dermat.* 1956, Oct., v. 74, No. 4, 405-10, 3 figs. & 1 graph. [10 refs.]

"A case of primary cutaneous coccidioidomycosis resulting from an accidental laboratory infection is reported.

"The criteria used in making this diagnosis are discussed in relation to other previously reported cases."

TROPICAL OPHTHALMOLOGY

GAN, K. H., WARSA, R., GO ING GAN, LO SIAUW KOEN & SUJUDI. **Haemagglutination by Sawah Virus isolated from Sawah Keratitis Westhoff.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, Sept., v. 8, No. 3, 264-8.

In previous work [this *Bulletin*, 1956, v. 53, 1487] the isolation of Sawah virus from a patient suffering from keratitis punctata tropica has been described. After adaptation the virus multiplied on the chorio-allantoic membrane of duck eggs. Suspensions of membranes from the 60th and 77th passage were examined in conventional titrations with various types of red cell, and it was found that the virus would agglutinate the red cells of some chickens, but would not agglutinate human group O, monkey, sheep, rabbit, guineapig, mouse or rat cells. The haemagglutinin of the 60th passage virus was destroyed by heating at 40°C. for 30 minutes, but the haemagglutinin of the 77th passage was considerably more resistant. Lower titres were obtained when the haemagglutination titrations were carried out at 4°C.

D. J. Bauer

GAN, K. H. & HEATH, A. A. **Some Observations on the Epidemiology of Sawah Keratitis Westhoff (Keratitis Punctata Tropica).** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, Sept., v. 8, No. 3, 269-71, 2 figs.

In 1950-52 119 cases of Sawah keratitis were observed among patients attending the ophthalmological clinic of the University of Indonesia in

Djakarta. The maximum incidence was in persons aged 25-40 years (68 cases) and very few children were affected. Most patients were town dwellers. The disease affected both eyes in only 20 instances. No seasonal incidence was observed.

D. J. Bauer

HEAT STROKE AND ALLIED CONDITIONS

AUSTRALIA, COMMONWEALTH OF: **Environmental Problems in Tropical Australia. Report of a Survey of Living Conditions in Tropical Australia with special reference to the Northern Territory and New Guinea** [MACPHERSON, R. K.]. 95 pp., 1 diagram. [Numerous refs.] 1956, Aug. 1. Canberra: Govt. Printer.

The recent rapid increase in the rate of development of tropical Australia, more especially in the Northern Territory and the territory of Papua and New Guinea, and the growth of population and the development of new industries, have served to draw attention to the special problems arising from the effects of tropical environment on a white population. The Government of the Commonwealth of Australia considered it desirable that a survey of living conditions in these areas should be undertaken for the purpose of identifying and defining the problems, and Macpherson was invited to undertake the enquiry which is the subject of this report.

The aims of the survey were (1) to determine what factors, especially those arising from or associated with the climate or geographical situation, reduce the individual's ability to work and detract from the living of a full and contented life in tropical Australia, (2) to indicate what might be done immediately to improve conditions or to remedy disabilities, and (3) to consider the desirability of undertaking some continuing study directed towards the solution of problems of living and working in hot environments and to advise on the nature and scope of such a research project.

The survey was carried out during a period of about 3 months. Interviews were sought with all ranks of the public services, employers and employees in private enterprise, medical practitioners and representatives of women's associations and of those concerned with the care and education of children. Visits were paid to farms, factories and mines, to hospitals and research institutions, and to private homes and Government offices.

It is concluded that in these tropical areas there is a reduction in efficiency which increases with the passage of time, reaching its maximum just before leave. The reduction is greatest in those engaged in the most exacting mental tasks and is least evident in those employed in unskilled or semi-skilled manual labour. The high rate of labour turnover

which, in some instances, reaches 150 per cent. per annum, is an indication that employees are dissatisfied with the conditions of life. The labour turnover is excessive even when allowance is made for the special conditions other than those of environment which operate in the areas. Examination of the amount of sick leave granted to public servants yielded inconclusive results, but the figures seem to indicate that whereas there is no difference between tropical and sub-tropical Queensland, there is an increase in the amount of ill health in New Guinea.

A systematic study of such records could provide valuable information. Excluding illness common to all areas of the world, the pattern of disease in these tropical areas is malaria and other fevers, the bowel disorders, skin disease, and tropical debility, and of these skin disease and tropical debility are considered to be largely the result of the environment. Skin disease (including neoplasia of the skin) is an important cause of illness and inefficiency in the tropics, and care and prevention are hampered by inadequate knowledge. There is an urgent need for research on the physiology of normal skin and the part played by heat and light in the causation of diseases of the skin. Tropical neurasthenia is a problem which is largely unsolved. The author stresses that up to the present the emphasis has been wrongly placed on the effect of the environment on the patient, instead of on the part played by the patient himself in the development of the illness. Here research by competent workers in psychiatry and psychology is urgently needed. The major forms of heat illness, such as heat exhaustion, syncope and hyperpyrexia, which are due to physiological failure to cope with the heat of the environment, are rare in the areas visited.

The transient nature of the population is a serious social problem. Even in North Queensland there is evidence of a constant drift out of the area, which is counterbalanced by the arrival of newcomers, so that a state of dynamic rather than of static equilibrium is produced. The severity of the climate is one of the many factors to which this shift of population is due. An enquiry into the composition of the population in the various areas of tropical Australia and the factors which determine it should be undertaken.

In these areas there is a gross shortage of both working and living accommodation, while much of that which is in use is unsatisfactory and should be replaced speedily. It is important that in any new building the best possible results should be obtained from the point of view of protection from environmental stress, and suggestions are made as to the steps which should be taken to ensure this. Public amenities are valuable adjuncts to tropical living, and their provision on a generous scale is advised.

In New Guinea and the Northern Territory it is the custom to take long leave in the home State every 2 years. It is considered that the interval between successive leaves is too long and it is recommended that the practice of taking annual leave should be encouraged.

Consideration is given to the number of hours worked and their distribution throughout the day. It is thought that for those engaged in sedentary occupations indoors there is no case for departure from the hours customary elsewhere. For those engaged in heavy industry with special heat problems, each case must be investigated separately. The regulation of the conditions of employment in hot industries in the tropics requires further research.

Much of the burden of tropical living falls on the housewife and attention is paid to her needs. The necessary equipment for a modern home in the tropics is described and it is shown that increasing mechanization in the home may provide a solution to the problem of native servants. There is need for increasing the supply of locally grown foods, for improved public transport, and for increased domiciliary medical practice. There is urgent need for the provision of institutions in the larger centres in which expectant mothers awaiting confinement can be accommodated.

The author holds strongly that the establishment of a permanent contented population in the tropics is conditional upon the ability of children to thrive there. The widely held belief that children must be sent out of the tropics at an early age is examined at length and it is concluded that the only valid reasons for this are sociological. The establishment of secondary schools in New Guinea should be expedited, and special consideration should be given to the provision of boarding schools in the Highlands. In view of the importance of the subject, further research is required on the effect of tropical environments on the physical and mental health of children.

Emphasis is laid on the need for care in the choice of clothing. Clothing worn in the tropics should impose the minimum burden on the wearer compatible with acceptable standards of dress. Research on the development of fabrics suitable for tropical wear is needed.

An account is given of the special problems relating to water supply and the importance of improving the existing supplies is stressed.

The consumption of alcohol in tropical Australia appears to be excessive, probably owing in large measure to the stress of the environment. It is considered that measures which result in the amelioration of climatic stress will tend to reduce the amount of alcohol consumed.

Methods of reducing climatic stress in buildings are considered. At present inadequate use is made of electric fans. In hot, dry environments evaporative coolers provide a simple and relatively cheap method of reducing air temperatures, and the extended use of these coolers in arid regions is recommended. The modern logical approach to the problems of reducing environmental stress is the use of air-conditioning, and if carried out on a sufficient scale this would provide the most important single contribution to increasing the output of effective work and improving the health and morale of those living in these areas. The use of air-conditioning in the home, especially in the bedrooms, as well as in public buildings, should be encouraged. Life in the tropics presents

special problems and education in these matters is urgently required. Those people going to the tropics for the first time should be instructed in the art of tropical living.

Finally, the need for a research organization for both civilian and military purposes is demonstrated. The scope of environmental research is discussed, suitable subjects for research are suggested, and full recommendations for a research programme are set out.

This outline of the report is based on the author's excellent summary. For a full appreciation of the importance of the findings here set out this fascinating report must be read in its entirety. It is to be hoped that the report will be given wide circulation for it is of outstanding importance, not only to Australia, but also to all who are in any way concerned with the problem of white settlement in the tropics. It is a contribution to sociology as well as to environmental medicine.

Thomas Bedford

HELLON, R. F., JONES, R. M., MACPHERSON, R. K. & WEINER, J. S.
Natural and Artificial Acclimatization to Hot Environments.
J. Physiology. 1956, June 28, v. 132, No. 3, 559-76, 4 figs.
[16 refs.]

Artificial acclimatization, which is achieved by repeated exposures in hot rooms, involves a progressive reduction in the increments in skin and deep body temperature and in heart rate accompanied by more rapid onset and greater production of sweat for the same exposure. More muscular work can be performed: the same level of work is accomplished with less discomfort.

A series of trials were carried out at Oxford to ascertain whether the degree of acclimatization of Europeans resident in a temperate climate (England) differed from those naturally acclimatized by residence for at least 6 months in the tropics (Singapore). It was also hoped that some comparison would be possible between natural and artificial acclimatization.

The group of Royal Naval volunteers taking part were virtually identical with the Singapore group in age, height and weight and the same environmental conditions and rest-work routine during exposure was adopted in both studies.

To avoid artificial acclimatization hot room exposures were limited to 2 for each man. In the first or uniformity trial all 32 men were exposed to the same moderately severe environmental conditions (85°F. wet bulb temperature (WBT); 100°F. dry bulb temperature (DBT); 100 ft./min. air movement) so that individual differences in criteria could be measured. In the second trial the men were exposed in pairs to various combinations of temperatures and air movements in a factorial design.

Uniformity trials. Total sweat loss was significantly higher in Singapore (S) than in Oxford (O). Mean rectal and skin temperatures of the

O group were initially slightly lower than in the S group but after 1 hour exposure were consistently higher. Mean pulse rate was the same at the start, but was some 32 beats/min. higher at the end.

Factorial trials. The results on the whole confirmed those of previous workers as to the effect of WBT, DBT and air movement [this *Bulletin*, 1953, v. 50, 1163].

It was concluded that residence in the tropics for an average period of 18 months confers an increased ability to withstand heat stress. Natural and artificial acclimatization, if not identical, have the same physiological basis. Natural acclimatization involves physiological as well as behavioural adaptation.

M. L. Thomson

TROPICAL ULCER

THOMSON, I. G. **The Pathogenesis of Tropical Ulcer amongst the Hausas of Northern Nigeria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 485-95. [18 refs.]

The author notes that tropical ulcer is the commonest single disease treated in out-patients and in-patients in the hospitals of Northern Nigeria, north of the palm-oil tree belt. From a study of these patients, the author deduces that injuries and scratched mosquito-bites are the probable usual local factors in producing ulcers, although some 7 per cent. arise in lesions due to *Dracunculus medinensis*. The organisms most frequently present are *Treponema vincenti* and *fusiform bacilli*. Dietary analyses showed deficiency of vitamin A and of vitamin B2 complex, notably riboflavin. There seemed to be more rapid ulceration in patients showing signs of advanced malnutrition of the skin, which leads the author to suggest that deficiencies of vitamin A and essential fatty acids are responsible for the great frequency and severity of tropical ulcers in the Hausa people. The author notes gangrene, osteomyelitis [this *Bulletin*, 1956, v. 53, 1174], ankylosis (especially from dracontiasis) and epithelioma as complications. The various factors are fully discussed in the text and in tables.

Frederick J. Wright

MISCELLANEOUS DISEASES

DESCHIENS, R. & POIRIER, M. Les caractères différentiels des hyperéosinophilies en fonction de leur étiologie. [Differential Features of Eosinophilia in Relation to Aetiology] Reprinted from *Presse Méd.* 1955, June 15, v. 63, No. 44, 917-18. [20 refs.]

The authors review the origin, course and interpretation of eosinophilia and reach the following conclusions—

A marked eosinophilia (over 30 per cent.) of parasitic origin maintains a fairly constant level. It usually is uninfluenced by the administration of corticotrophin or of cortisone.

The level of a marked eosinophilia not of parasitic origin fluctuates (20 to 60 per cent.). It usually declines on the administration of corticotrophin or of cortisone.

These distinctions between the 2 types of eosinophilia are not absolute. A parasitic eosinophilia of under 20 per cent. often falls after the hormone treatment; conversely, a heavy eosinophilia of non-parasitic origin, such as is seen in severe asthma or following radium or X-ray exposures, may not decline after the hormone administration. Again, certain artificially induced heavy non-parasitic eosinophilias may fail to respond to corticotrophin or cortisone treatment just as do those of parasitic causation.

A. R. D. Adams

GELFAND, M. Tropical Eosinophilia. *Central African J. of Med.* 1956, Aug., v. 2, No. 8, 289-90.

In 1950 BALL [this *Bulletin*, 1951, v. 48, 583] in dealing with tropical pulmonary eosinophilia, mentioned its alleged absence from Southern Africa. The present author is now satisfied that tropical eosinophilia is more common in Rhodesia than is thought; any eosinophilia there is commonly ascribed to schistosomiasis. Details are given of 2 cases (one a European girl aged 5 years and the other a male European aged 27) in which a diagnosis of tropical eosinophilia was made in the absence of any evidence of a schistosomal infestation. The first case did not clear on arsenic treatment, but the second did so.

According to Ball the outstanding features of the condition, though it tends to vary, are: (1) a history of persistent cough or asthma; (2) eosinophilia high enough to produce a leucocytosis; (3) miliary mottling on chest X-ray in about half the cases; (4) a therapeutic response to arsenic.

A. R. D. Adams

McFADZEAN, A. J. S. & TSANG, K. C. Antibody Formation in Cryptogenetic Splenomegaly. I. The Response to Particulate Antigen injected intravenously. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Sept., v. 50, No. 5, 433-7, 2 figs. [16 refs.] II. The Response to Antigen injected subcutaneously. *Ibid.*, 438-41, 2 figs.

"Cryptogenetic splenomegaly" is a syndrome of enlargement of the spleen (often massive) associated with liver damage (both "diffuse hepatic fibrosis and post-necrotic scarring"). There is clinical evidence that the splenomegaly anticipates the liver damage. Splenic changes include numerous dilated endothelial-lined sinusoids and periarticular and trabecular fibrosis. There is commonly a reduction in the numbers of all blood cells; in a high proportion of cases the anaemia appears to have a haemolytic element.

I. The production of haemolysins following intravenous injection of the antigen (washed sheep erythrocytes) was watched in 26 such cases. In 10, cirrhosis was well established. In the remainder (half with gross, half with moderate splenomegaly) the liver changes were less severe. Controls included 11 normal persons and 10 cases of cryptogenic splenomegaly (5 with cirrhosis) in which the spleen had been removed 5-24 months before the injection of the antigen.

The haemolysin titre in the patients with cirrhosis and in splenectomized patients was significantly lower than that obtained in normal persons. The titre was not significantly different from normal in patients without cirrhosis, irrespective of the size of the spleen.

The authors conclude that the enlarged spleen is capable of response to particulate antigen injected intravenously. Reduction of the titre in patients with cirrhosis may be due to disordered gamma globulin metabolism.

II. Agglutinin titres were determined after subcutaneous injection of heat-killed *Salmonella typhi* in 25 cases of cryptogenic splenomegaly (11 with established cirrhosis), 9 normal controls and 15 splenectomized patients (8 with cirrhosis).

The H-agglutinin titres in the patients with splenomegaly (with and without cirrhosis) were significantly lower than in the normal controls. The titres in the splenectomized were normal.

The authors conclude that suppression of the response to this antigen injected subcutaneously is "part of the hypersplenic syndrome and is corrected by splenectomy". (They point out that GOHAR *et al.* [this *Bulletin*, 1952, v. 49, 878] obtained similar results with *Salm. typhi* vaccine injected subcutaneously into patients with schistosomal cirrhosis and into splenectomized patients.)

B. G. Maegraith

DOWLING, J. H. & LEVINE, H. B. **Hexose Oxidation by an Enzyme System of *Malleomyces pseudomallei*.** *J. Bacteriology.* 1956, Oct., v. 72, No. 4, 555-60, 3 figs. [20 refs.]

PARASITOLOGY: GENERAL

ACADEMY OF SCIENCES OF U.S.S.R. [Parasitological Symposium] 1953, v. 15, 424 pp. 1956, v. 16, 279 pp., numerous figs. [Numerous refs.] [In Russian.] Moscow: Leningrad: Parasitological Department, Zoological Institute.

These two volumes of Parasitological Symposia of the Russian Academy of Sciences contain original papers on ecto- and endoparasites of various host-animals in the territory of the Soviet Union.

In vol. 15, I. E. BYKHOVSKAYA-PAVLOVSKAYA (pp. 5-116) gives a monographic description of the trematodes from birds of Western Siberia, with illustrations, keys to species and lists of hosts. M. N. DUBININA (pp. 117-233) deals in a similar manner with the cestodes of birds from the same territory. A second paper by the same author (pp. 234-251) is devoted to the host-specificity of Pseudophyllidean tapeworms at different stages of their life-cycle. V. B. DUBININ (pp. 252-301) describes various parasites occurring in and on murines in the Volga delta. Three papers are devoted to mites: a general account of the mites of the Far East is given by N. G. BREGETOVA (pp. 302-338), I. N. RAZUMOVA (pp. 339-344) describes Liponyssid mites from rodents, while harvest mites found on rodents in the Leningrad province are dealt with by S. O. VYSOTSKAYA and E. G. SHLUGER (pp. 345-352). A. N. BERZINA (pp. 353-385) discusses the conditions under which black gnats (*Simulium*) attack man. A useful systematic and biological account of fleas (with a list of hosts) of the Leningrad province is given by S. O. VYSOTSKAYA and O. N. SAZONOV (pp. 386-409), and finally K. A. BREEV and Z. F. KARAZEEVA (pp. 410-424) describe the cutaneous gadfly of reindeer.

In vol. 16, D. I. BLAGOVESHCHENSKI⁹ (pp. 5-88) describes the structure and systematic importance of the genital apparatus in Mallophaga. A. S. MONCHADSKI⁹ (pp. 89-144) discusses the conditions under which mosquitoes attack man in the Volga delta, and O. N. SAZONOV (pp. 145-151) describes and depicts a new mosquito *Aëdes (Ochlerotatus) grandilarva* sp.n. from the European part of U.S.S.R. New horse-flies, *Tabanus (Tylostipia) obscurinervis* sp.n. and *T. (T.) olivaceus* sp.n., are recorded by N. A. VIOLOVICH (pp. 152-154). K. A. BREEV (pp. 155-183) describes the factors which influence the attacks of gadflies on reindeer. Two papers, by N. G. BREGETOVA and S. A. KOLPAKOVA (pp. 184-197) and A. A. GONCHAROVA (pp. 198-209), are devoted to mites in the Volga delta and Western Siberia respectively, while V. I. VOLGIN (pp. 210-212) describes 2 new predacious ticks, *Cheletonella caucasica* sp.n. and *C. mirabilis* sp.n. M. N. DUBININA and L. A. SMOGORZHEVSKAYA (pp. 213-216) provide evidence that the avian parasite previously described as a nematode, *Squamofilaria macroovata*, is in fact a pentastomid known as *Reighartia sterna*. Two papers, by N. A. IZIUMOVA (pp. 217-228, 229-243) deal with the host-specificity and biology respectively of the

monogenetic trematodes of the genus *Dactylogyrus*, and trematodes from fish-eating birds of the Dnieper delta are described (with list of hosts) by L. A. SMOGORZHEVSKAYA (pp. 244-263). In the last paper E. V. ZHUKOV (pp. 264-270) describes helminths and parasitic arthropods of birds of prey from southern Russia.

C. A. Hoare

FRICK, L. P., MOON, A. P. & LIN, S. S., with the technical assistance of S. ASAKURA & Y. HISHINUMA. **Parasitologic Studies in the Far East.**

XV. A Preliminary Survey for Parasitism in Southern Formosa.

Metabolism. New York. 1956, May, v. 5, No. 3, 302-8. [16 refs.]

XV. This paper records, among other data, the incidence of intestinal helminthic and protozoan infections in 1,073 Chinese troops, one-half of whom subsequently received a vermifuge. Of these men 8.5 per cent. were negative for any parasite: the chief helminths were hookworm 72.1 per cent., *Trichuris trichiura* 58.8 per cent. and *Ascaris lumbricoides* 19.7 per cent.; the chief protozoa were *Entamoeba histolytica* 23.9 per cent., *Endolimax nana* 22.5 per cent. and *Entamoeba coli* 15.3 per cent.

In samples of faeces from 774 of these men the concentrations of hookworm infection (eggs/gm. of faeces) were: nil, 29.7 per cent.; 1-399, 37.7 per cent.; 400-2,999, 30.2 per cent.; 3,000-9,999, 2.2 per cent.; 10,000 and over 0.1 per cent. The incidence of helminthic infections tended to be lower than that in a control group of 725 Taiwanese.

R. Passmore

HEISCH, R. B. **Zoonoses as a Study in Ecology with special reference to Plague, Relapsing Fever, and Leishmaniasis.** *Brit. Med. J.* 1956, Sept. 22, 669-73. [15 refs.]

This paper [which was given in the opening session of the Zoonosis Conference held in Kampala in January 1956] traces the evolution of parasitic infections in their various hosts and shows how this is influenced throughout by environmental or zoogeographical factors. The term zoonosis is simply defined as infections of man naturally acquired from other vertebrates, though the process may occur in reverse, an infection passing from man to animal. Only arthropod-borne forms are considered in this paper.

The author stresses the importance of the "holistic" or "synecological" approach to the problem: a complex is formed by the organism, the vertebrate, the vector, and various features of the environment; this is not static, however, and represents not merely the sum of its parts, but something new, which may again give rise to new combinations and present an ever changing epidemiological pattern. This is illustrated by what happens in relapsing fever, leishmaniasis and plague.

The importance of a resistant host is emphasized for the maintenance of an infection in nature, *e.g.*, certain wild rodents like *Arvicantis* or *Otomys* spp. act as good reservoirs of the plague bacillus, which would soon disappear if it had to depend solely on the domestic rat or man; the former are termed "permanent" hosts, the latter "temporary", and each fills a different "niche" in nature. If a number of different conditions are necessary for the formation of a zoonosis, then it will be only where such conditions exist that the zoonosis will flourish, and usually such combinations will be discontinuous and lead to a focal distribution of the zoonosis. Thus, in Kenya, permanent foci of sylvatic plague are to be found in the foot-hills above the Rift Valley, equally in India in the foot-hills of the Himalayas; but never in the cultivated plains below. A similar focal distribution is sometimes seen in scrub typhus, in relapsing fever and in yellow fever. When conditions alter, as in the plains, the infection may tend to flare up into an epidemic; such unstable areas are called "ecotones", and are found also in the margin of forests (with its "fringe habitat"). [See also this *Bulletin*, 1952, v. 49, 1086.]

P. C. C. Garnham

HARTZ, P. H. **Use of the Phase-Contrast Method in Parasitological Examination of Faeces.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, June, v. 8, No. 2, 164-6.

The author strongly advocates the use of phase-contrast microscopy for the parasitological diagnosis of faecal preparations. For work under tropical conditions it is not necessary to use a large stand with built-in illumination, but a small portable stand serves the purpose. However, a powerful lamp with a collector lens and an iris diaphragm is indispensable, and the use of a green filter is recommended, with anisol, instead of cedar oil, for the immersion.

The best results are obtained from examination of thin faecal preparations diluted with saline. Working in Venezuela, the author confirmed the usefulness of this method by examination of 400 faecal specimens, which included the following parasites: ova of nematodes, larvae of *Strongyloides*, *Giardia*, *Chilomastix*, *Trichomonas*, amoebae and their cysts.

C. A. Hoare

JUNG, R. C. & FAUST, E. C. **The Treatment of Intestinal Parasitic Infections.** *Arch. Intern. Med.* 1956, Oct., v. 98, No. 4, 495-504. [32 refs.]

The authors consider that the better recent treatment of the parasitic infections of the bowel, both protozoal and helminthic, is as much due to a fuller appreciation of the principles of diagnosis and of the natural history of the infections as to new drugs. Of the antibiotics available for

the treatment of acute amoebic dysentery they prefer erythromycin, because it alters the intestinal flora less than does the tetracycline series of antibiotics. Concurrently a drug such as Milibis (bismuth glycolyl-arsanilate) should be given, or Diodoquin (di-iodohydroxyquinoline) or fumagillin may be used instead of it. If these fail to control the dysentery emetine becomes necessary; but this drug is cumulatively toxic. "In all cases of intestinal amebiasis" chloroquine should be given prophylactically to forestall an amoebic liver infection. The drugs used for non-dysenteric amoebic colitis also are Milibis, Diodoquin and fumagillin; the tetracycline antibiotics and erythromycin are here unnecessary, and they should be avoided in view of the danger of creating strains of bacteria resistant to them. Similar treatment is given in presumptive cases of amoebiasis in which a parasitic diagnosis has not been made; but an apparent response of these cases to the treatment should not be held to prove the diagnosis.

The non-pathogenic amoebae can usually be eradicated by treatment with Milibis, Diodoquin, erythromycin, and fumagillin. A *Giardia* infection is eliminated by meprazine; *Balantidium coli* infection yields to treatment with carbasone or, better, oxytetracycline.

The consequences of infection with *Trichinella spiralis*, when it is established and producing larvae, are unaffected by drug treatment. *Trichuris trichiura* can be destroyed by hexylresorcinol enemata. *Ascaris lumbricoides* and *Enterobius vermicularis* are best attacked with the piperazine series of drugs. Tetrachlorethylene is the best available anthelmintic for hookworm infestations; but, as in the case of whipworm infection, the last few worms are always hard to eradicate; *Strongyloides stercoralis* infection yields, it is stated, to treatment with methylroseniline chloride; this is given in enteric-coated tablets over a period of 4 days. Oral meprazine is advocated for tapeworm infections; sodium bicarbonate with the dose is said to lessen the risk of its being vomited. The schistosomiases are not indigenous to the United States, but many immigrants (especially Puerto Ricans) suffer from infection with one or other of these parasites. Antimony potassium tartrate is stated to be the most effective drug for eradication of these parasites [the sodium salt is not mentioned].

A. R. D. Adams

CABRAL, A. S. Notas sobre o *Pneumocystis carinii*. Raridade atual dêste parasito em animais de laboratório. [Notes on *Pneumocystis carinii*, and its Rarity in Laboratory Animals] *Mem. Inst. Oswaldo Cruz*. 1956, June, v. 54, No. 1, 87-91, 1 fig. [20 refs.]

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

HARANT, H., RIOUX, J. A. & JARRY, D., with the technical collaboration of A. BRÈS. Les culicides autochtones et anémochores de la ville de Montpellier. [Mosquitoes in the Town of Montpellier] *Montpellier Méd.* 1956, May, v. 49, No. 5, 450-72, 9 figs. [12 refs.]

In the south of France *Aëdes detritus* and *Aëdes caspius* may be carried into towns near the coast, and *Culex pipiens molestus* is also recorded as a nuisance native to the towns. Keys are given, with brief biological notes, to the 15 mosquito species occurring in the region.

B. R. Laurence

LEWIS, D. J. The Medical Entomology of the Tonkolili Valley, Sierra Leone. *Ann. Trop. Med. & Parasit.* 1956, Sept., v. 50, No. 3, 299-313, 1 map. [38 refs.]

The very wet wooded upland valley of the river Tonkolili in Sierra Leone is to be developed for iron-mining. Onchocerciasis and other insect-borne diseases are present and it will be necessary, apart from normal control measures, to ensure that human activities do not cause any further threat to human health.

The author visited the area and found the insects recorded in this paper between September and December 1955. Most of the collections were made around Farangbaya because this part of the valley is typical of the territory to be developed and because the absence of roads made frequent journeys further afield impracticable. Farangbaya lies at 1,090 feet altitude and there are no cattle and few large wild animals nearby.

Among the insects discussed is a bug (*Phytolyma lata*) which the local people confuse with *Simulium*. In fact, enquiries about the latter insect are apt to result in misleading replies. Eight species of *Simulium* were taken though only *S. damnosum* bites man. About 85 per cent. of the indigenous adult population were infected with onchocerciasis, but there was very little blindness. The infection rate among the flies was 10 per cent. (of 869 flies dissected).

Ceratopogonidae were rare but may be commoner in the dry season and *Phlebotomus collarti* was the only sandfly caught.

Ten species of *Anopheles* were found but only 3, *A. marshalli*, *A. hancocki* and *A. gambiae* were common. Few *A. funestus* were present. *A. marshalli* commonly bites out of doors at dawn and was once seen biting indoors in early morning. *A. hancocki* also feeds outside at dawn; sporozoites were found in one specimen out of 115 dissected; it is thought

to be a malaria vector of minor importance and it is hoped that the measures taken to control *A. gambiae* will control *A. hancocki* also. Specific control of *A. hancocki* would probably be very difficult owing to its exophilic habits and hidden scattered breeding places. *A. gambiae* was numerous in a few places and larvae were found only in artificial pools of which there were extremely few. The presence of this species is probably due to human activity. Two out of 20 *A. gambiae* contained developing filarial worms, probably *Wuchereria bancrofti*. Forty-two other Culicidae were recorded, only a few of which bite man. An outbreak of yellow fever occurred in 1950 about 42 miles north of Farangbaya; but though there are at least 2 species of monkeys in the Tonkolili forests, the author considers it unlikely that an epidemic could occur in the villages, because the only potential vectors found to bite man locally, *Aëdes aegypti* and *A. africanus*, are not numerous at ground level. When the valley is developed it will be necessary to prevent the multiplication of small mosquito breeding places and to watch for the possible introduction of *Aëdes simpsoni*.

Tabanidae consisted of only 7 species but no *Chrysops* or *Haematopota* were found.

Muscidae included a few house-flies; the projected mining operations will bring in many labourers and fly control will form an important health measure. *Glossina fusca* and *Glossina palpalis* form *gambiensis* were also recorded.

The paper concludes with some notes on Arachnida and fish and on vernacular names for some insects.

H. S. Leeson

See also p. 117, PETERS, **The Mosquitos of Liberia (Diptera; Culicidae)**

VARGAS, L. Especies y distribución de mosquitos mexicanos no anofelinos (Insecta Diptera). [Species and Distribution of Non-Anopheline Mosquitoes in Mexico] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, Mar., v. 16, No. 1, 19-36.

The English summary appended to the paper is as follows:—

"The non-anopheline mosquitoes of Mexico are included in 15 genera with 25 subgenera and 156 species. All the genera and subgenera of mosquitoes from the Southern Pacific are represented in Mexico but the reverse is not true.

"The genera and subgenera of neotropical mosquitoes that do not go beyond Mexico are numerous and the holarctic and nearctic species of the United States that do not extend to this country are few. There are no genera or subgenera exclusive to Mexico but many species are. The most important genera and the number of species found in Mexico are:

Culex (49), *Aëdes* (43), *Psorophora* (16), *Wyeomyia* (11) and *Uranotaenia* (8)."

HUDSON, B. N. Anne. **The Behaviour of the Female Mosquito in selecting Water for Oviposition.** *J. Exper. Biol.* 1956, Sept., v. 33, No. 3, 478-92, 8 figs. [12 refs.]

" 1. Egg-laying *Culex molestus* and *Aëdes aegypti* were able to discriminate between solutions of NaCl ranging from 0 (distilled water) to 0.136 M. Significantly fewer eggs were laid in solutions above 0.085 M.

" 2. Similar series of solutions of KCl, MgCl₂ and Na₂SO₄ showed a similar distribution of eggs, but mosquitoes were apparently unable to distinguish between MgSO₄ solutions below 0.144 M.

" 3. Results from all these salts were related to the osmotic pressures produced, but experiments in which isotonic solutions of glucose and NaCl were offered simultaneously showed osmotic pressure was not a critical factor.

" 4. Experiments were carried out to locate the sensory areas responsible for discrimination. The possibility that drinking might be associated with the choice of a solution for egg-laying was investigated by removing the proboscis; operated insects were still able to detect differences in concentration. Covering or removing various regions of the legs revealed that the chemoreceptors concerned were distributed on all the tarsi; indications that they may also be found on the tibiae were obtained." [See WALLIS, this *Bulletin*, 1955, v. 52, 486.]

SMITH, A. **Notes on Microclimate at the Sites of Breeding and Biting of *Aëdes* Species (Diptera: Culicidae) on Ukara Island, Tanganyika.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1956, June 29, v. 31, Pts. 4/6, 81-5.

This is a preliminary report of observations on Ukara Island, Lake Victoria. Water in a rock pool containing *Aëdes vittatus* varied in temperature during the day by 4.5°C., rising 5°C. above air temperature at the hottest part of the day. In contrast, water in rot holes containing *Aëdes africanus*, *A. aegypti* and *A. apicoargenteus* varied by 1-2°C., and rarely exceeded air temperature. Reflected light was 0-60 foot-candles (FC) from the surface of the rock pool compared with 0-2.4 FC at the surface of a rot hole. More biting *Aëdes* were caught on human bait near foliage with dark interiors (2 FC) than near foliage with brighter interiors (20 FC). "It was concluded that any advantageous differences of temperature, humidity or light at the position of the mosquito catchers were masked during daylight hours by the presence nearby of suitable thicket, which is a resting place for *Aëdes*." B. R. Laurence

COLLINS, W. E. **The Effectiveness of Pyrethrum and Allethrin Formulations in a Thermal Fog Machine.** *J. Econom. Entom.* 1956, Oct., v. 49, No. 5, 610-11.

"Tests were conducted to determine the loss in toxicity of formulations of pyrethrum and allethrin when passed through a *Swingfog* insecticide applicator. Samples of the fog were collected and tested against formulations not subjected to the fogging process. Larvae of *Aedes aegypti* (L.) were used as the test insect. Under the conditions tested, pyrethrum, allethrin, allethrin plus piperonyl butoxide, and allethrin plus n-propyl isome showed highly significant losses in toxicity as a result of the fogging treatment."

MITRA, R. D. **Notes on Sandflies, Sandflies of Poona District.** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, June, v. 7, No. 2, 228-40, 2 figs. [Numerous refs.]

Between March 1951, and December 1953, a sandfly survey was made in Poona District. The following species were taken: *Phlebotomus argentipes*, *P. a. var. glaucus*, *P. papatasi*, *P. squamipleuris* var. *poonaensis*, *P. smithi* and *P. thapari*. The 2 varieties and the last 2 species were new to science and are described elsewhere. *P. argentipes* is found mostly in cattle-sheds and *P. papatasi* in houses and this is thought to indicate host preferences for cattle and man, respectively. Both species, including gravid specimens, occur in large numbers throughout the year. Although kala azar and oriental sore are not apparently endemic in the district, a widespread outbreak of fever, resembling clinically a mild sandfly fever, occurs during and after the monsoon season. *P. papatasi* is notably numerous at the beginning of these epidemics but this is the only evidence to suggest that it may be a vector.

Only a single larva, probably *P. argentipes*, was found in 37 soil samples from in and around a cow-shed and 2 mud-houses. The positive sample was a small sticky mass of earth from a passageway leading to the cow-shed.

In experiments, *P. papatasi*, *P. smithi*, and *P. thapari* fed readily on man, but *P. argentipes* was more reluctant.

Mites of the genus *Raphignathus* were found attached by their mouth-parts to adult sandflies. Four per cent. of *P. papatasi* were affected. *R. smithi* is a new species described elsewhere. *D. S. Bertram*

RODRÍGUEZ M., J. D. Los phlebotomus del Ecuador (Diptera, Psychodidae). VI. Nuevas capturas. Descripción de una nueva especie. Resumen y distribución geográfica. [Phlebotomus of Ecuador. VI. New Collections, Description of a New Species, and Geographical Distribution] *Rev. Ecuatoriana de Hig. y Med. Trop.* Guayaquil. 1956, Apr.-June, v. 13, No. 2, 75-83, 18 figs. on 2 pls.

LINDQUIST, D. A. & FAY, R. W. **Laboratory Comparison of Eight Organic Phosphorus Insecticides as Larvicides against Nonresistant House Flies.** *J. Econom. Entom.* 1956, Aug., v. 49, No. 4, 463-5.

"Laboratory comparisons of the larvicidal efficiency of eight organic phosphorus insecticides were made using surface applications of various xylene emulsions on breeding material containing various size fly larvae. Diazinon proved to be the most effective, giving better than 90% mortalities of small, medium, and large house fly larvae at application rates of 5 mg. of Diazinon per sq. ft. In general the compounds were more effective on the small or medium size larvae than on the large larvae and were relatively ineffective against fly pupae. In order of decreasing effectiveness the compounds were Diazinon, EPN, parathion, Bayer 21/199, NPD, demeton, Bayer L 13/59, and malathion."

BYERS, G. W., WHEELER, C. M. & BLAKESLEE, T. E. **A Study of Insecticide Resistance in House Flies of Japan and Okinawa.** *J. Econom. Entom.* 1956, Aug., v. 49, No. 4, 556-7.

"The susceptibilities of five strains of the adult house fly, *Musca domestica* L., to four insecticides were determined by topical application. All strains, four from Japan and one from Okinawa, were moderately resistant to DDT and highly susceptible to dieldrin and malathion. Two strains, one which had been exposed to lindane and the other which had been exposed to BHC for a period of less than a year, were approximately 10 times as resistant to lindane as were the other three strains which had received no exposure to this material."

FRONTALI, Nora. Attività della colinesterasi in ceppi sensibili e in ceppi resistenti al DDT di *Musca domestica* L. [Cholinesterase Activity in DDT susceptible and DDT resistant Strains of *Musca domestica* L.] *Rendiconti Istituto Superiore di Sanità.* Rome. 1956, v. 19, Pts. 7/8, 555-68. [24 refs.]

The English summary appended to the paper is as follows:—

"1) DDT added *in vitro* to head homogenates of susceptible and resistant house-flies had no inhibitory action on cholinesterase.

"2) A survey of cholinesterase activity on several strains of houseflies (susceptible, *knockdown* and *kill* resistant, and *knockdown* susceptible but *kill* resistant) showed no relation between enzyme activity and resistance of either type.

"3) An experiment performed on the progeny of single pairs obtained from three different strains, showed a variability within the strains which abolished the significance of differences between strains."

LEWIS, S. E. & FOWLER, K. S. **Effect of Diisopropylphosphorofluoridate on the Acetylcholine Content of Flies.** [Correspondence.] *Nature.* 1956, Oct. 27, v. 178, 919-20, 2 figs.

MITLIN, N. **Inhibition of Development in the House Fly by 3,4-Methylenedioxypheyl Compounds.** *J. Econom. Entom.* 1956, Oct., v. 49, No. 5, 683-4.

[See this *Bulletin*, 1955, v. 52, 303.]

MELIS, R. & CATELLA, F. La lotta organizzata contro la mosca domestica.

Prime applicazioni in alcuni centri turistici e di cura della Toscana.

[**Control of House-Flies. First Trials in Various Areas in Tuscany**]

Riv. Italiana d'Igiene. 1956, Mar.-Apr., v. 16, Nos. 3/4, 186-69, 10 figs. English summary.

In Italy, as elsewhere, resistance to chlorinated hydrocarbon insecticides renders them virtually useless for control of house-flies. The authors turned to the organo-phosphorus insecticides and use a method employed against the *Dacus* fly pest of olives; that is the incorporation of beet molasses bait with the insecticide. The insecticide chosen was malathion (which has low toxicity to mammals) and it was used at the rates of 0.5 or 1 per cent. together with 1 or 3 per cent. of molasses, in water. The mixture was sprayed at the rate of 1 litre per 15 m.² on surfaces adjacent to fly breeding places (rubbish heaps, manure piles, animal pens) or fly attracting places (kitchens, latrines).

The paper describes field trials of the method in 2 or 3 small towns or villages in 2 areas of Tuscany. After a systematic search of the areas, the fly foci were noted and treated at intervals, in the summers of 1953 and 1954. The effects were judged by fly catches on sticky papers in sampling points in the treated zones and outside. It was observed that 4 to 8 treatments reduced the fly population by 83 to 87 per cent. throughout the summer.

J. R. Busvine

GALBIATI, F. Il "Dition", nuovo insetticida per uso civile. [**Dition, a New Insecticide for Use against House-Flies**] *Riv. di Malariologia.* 1956, June, v. 35, Nos. 1/3, 59-71, 1 graph. English summary.

The use of phosphoric esters against DDT-resistant house-flies has its own drawbacks. These compounds are highly toxic to warm-blooded animals, their insecticidal action is only moderate and their persistence is short. Further research into these compounds has resulted in the synthesis of "Dition".

Dition is the proprietary name for the compound O,O-diethyl thiophosphate of the 7-oxy-3,4-tetramethylene cumarine. Pure Dition looks crystalline and has a high melting point, 190.5-191.5°F. It is not absorbed by porous surfaces and it is practically insoluble in water. It is the least volatile of the phosphoric esters, making it the most persistent of these insecticides, and the one most tolerable to man in

human dwellings. Dition is apparently more stable than the other phosphoric esters.

As an insecticide for practical purposes Dition is available as a paste formulation in combination with DDT (synergized DDT 55 per cent., Dition 25 per cent., auxiliaries 20 per cent.). The potency and persistence of Dition paste have been compared with those of 2 other pastes, one containing DDT only, the other a liquid phosphoric ester. Houseflies were exposed to porous surfaces treated with these paste formulations for varying times an hour after treatment, and also at different times after treatment up to 9 months. The flies were transferred to recovery cages. Knocking down effect was observed for the first 5 hours. Mortality counts were made 20 hours later. Under the conditions of these tests only the Dition paste showed a significant knock-down effect and an overall high mortality. The liquid phosphoric ester paste showed only a moderate kill (most of the active material having been lost in the porous substance of the treated surface). The DDT paste showed the least effect. These findings have been confirmed by field tests. *W. Z. Coker*

WEBB, J. E., Jr. & GRAHAM, H. M. **Observations on some Filth Flies in the Vicinity of Fort Churchill, Manitoba, Canada, 1953-54.** *J. Econom. Entom.* 1956, Oct., v. 49, No. 5, 595-600.

"Twenty-seven species of filth flies are recorded from studies conducted in the vicinity of Fort Churchill, Manitoba, Canada in 1953 and 1954. Studies on biology, habits, abundance, seasonal occurrence and probable importance in human enteric disease transmission are reported for several species. *Musca domestica* and two species of Calliphorid flies *C. cadaverina* and *P. terraenovae* were observed frequenting indoor messes in limited numbers. None were observed in any significant numbers at food preparation or food serving activities at troop bivouacs or outdoor camps. Human feces left on the surface of the ground at winter bivouac snow latrines, and also fresh feces, appeared to be a negligible source of filth flies of probable medical importance during the conduct of these studies."

VARGAS, L. Relación de moscas Oestroideas mexicanas poco conocidas (Insecta Diptera). [Observations on Little-known Oestrid Flies of Mexico] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1956, Mar., v. 16, No. 1, 37-45. English summary (7 lines).

OVAZZA, M., HAMON, J., RICKENBACH, A. & MOREL, J. Contribution à l'étude des Tabanidae (Diptera) d'Afrique occidentale française. [Study of Tabanids of French West Africa] *Ann. Parasit. Humaine et Comparée.* 1956, July-Sept., v. 31, No. 4, 436-48, 4 pls.

STARKOFF, O. Presenza in Italia di *Argas persicus* (Oken, 1818).
 [Presence of *Argas persicus* in Italy] *Nuovi Ann. d'Igiene e Microbiol.*
 1956, July-Aug., v. 7, No. 4, 304-5. English summary (2 lines).

BETTINI, S., NATALIZI, G. & BOCCACCI, M. Osservazioni sul meccanismo
 di azione degli acidi iodo-, bromo- e cloroacetico sulla blatta, *Peri-
 planeta americana*. [Observations on the Mode of Action of Iodo-,
 Bromo-, and Chloro-Acetic Acids on *Periplaneta americana*] *Riv. di
 Parassit.* Rome. 1956, July, v. 17, No. 3, 179-83.

[See this *Bulletin*, 1955, v. 52, 1155.]

MENGLE, D. C. & FISK, F. W. **The Toxicities of Certain Antibiotics to
 the German Cockroach.** *Antibiotics & Chemotherapy.* New York.
 1956, Oct., v. 6, No. 10, 607-14, 1 fig. [14 refs.]

Graded doses of several antibiotics were either injected into or given
 in food to 2 strains of German cockroach, *Blattella germanica*, one of
 which was normal and the other chlordane-resistant. Tables show the
 LD50 values over 72 hours. A significantly lower LD50 was obtained
 with the chlordane-resistant strain than with the normal strain on
 injection with streptomycin, but no other experiment showed significant
 differences in the tolerance of the strains to the several antibiotics.

In a later experiment chlordane-resistant roaches were injected with
 chlordane at intervals of 1, 6 and 24 hours after injections of sublethal
 doses of penicillin or streptomycin. The antibiotics rendered the roaches
 more susceptible to chlordane after 1 hour, less so at 6 hours and not
 after 24 hours. This is not interpreted as a synergic effect in the initial
 hours.

In the discussion some literature is quoted which indicates that
 ingestion of antibiotics by insects (mainly stored product pests) normally
 harbouring microsymbionts may well be helpful in their control, either
 by a direct effect on the insects themselves or by preventing the normal
 development of their progeny in the absence of the microsymbiont. It is
 also suggested that cockroaches might serve as a test organism in initial
 screening tests of antibiotics for toxicity.

D. S. Bertram

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. No. 110.
Expert Committee on Insecticides, Geneva, 4-11 October 1955.
Sixth Report. 88 pp., 13 figs. [Refs. in footnotes.] 1956, Oct.
 Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery
 Office.] [3s. 6d.; \$0.60; Sw.fr. 2.-.]

Nearly all this report deals with apparatus for the application of
 insecticides. There are 35 pages discussing the general points, concerning

the most satisfactory equipment and methods, followed by 50 pages of specifications and similar technical details.

The apparatus concerned are: (i) pneumatic (compression) sprayers, which are regarded as most suitable for applying residual deposits; (ii) hydraulic (stirrup-pump) type sprayers, somewhat less satisfactory; (iii) piston-operated hand dusters and (iv) fogging and misting machines, for which optimum particle sizes and recommended outputs are given. Notes are given on maintenance of equipment and protective clothing for operators. A procedure for impregnating fabrics with insecticide is mentioned (details in the appendix) and a few notes given on application of molluscicides.

A short section on aircraft disinsectization discusses the merits and disadvantages of (i) automatic disinfectors fixed in the aeroplane and (ii) single use disposable aerosol dispensers. The former method is considered unsatisfactory, on balance; but the latter technique shows promise. Two kinds of disposable dispenser are described.

J. R. Busvine

BURNETT, G. F. & THOMPSON, B. W. Aircraft Applications of Insecticides in East Africa. X.—An Investigation of the Behaviour of Coarse Aerosol Clouds in Woodland. *Bull. Entom. Res.* 1956, Oct., v. 47, Pt. 3, 495–524, 3 text figs. & 4 figs. on pl. [12 refs.]

Aerosols of a solution of DDT in oil were disseminated from an aircraft in a series of experiments over open ground and woodland in Tanganyika Territory, near Arusha. The effective distribution of the insecticide was determined from the kill of wild-caught *Musca lusoria* in numerous small cages (6 inches × 3 inches × 3 inches) suspended on trees or other supports at known positions relative to the flight-line of the aircraft. Meteorological data were recorded in association with the flights. The emission rate was 10 gallons per minute of DDT (technical DDT in equal parts of Shell Power Kerosene and Shell Diesoline) at 1·6 per cent. concentration or 10 per cent. concentration according to the number of runs of the aircraft. Experiments on open ground were at the Arusha airfield and woodland sites were 2 and 10 miles from the airfield.

In open country in conditions of moderate to high atmospheric disturbance 100 per cent. mortality can be expected for 300 yards downwind from the line of flight. In very open woodland, tree foliage and trees up-wind give a high degree of protection to insects to leeward. Insecticide particles may perhaps be filtered out by impact with these structures or the aerosol may rise over the thin woodland as a whole or over individual trees.

With little turbulence in the atmosphere insecticide sedimented well on to continuous woodland although distribution was uneven and much of the insecticide was filtered off by the canopy. Kills of the caged flies were less at the foot of than in the trees. Clearings in woodland affected

distribution depending on the turbulence of the air above the wood. With slight or moderately turbulent air conditions insecticide was dispersed, under the canopy, round the edge of the clearing and downwind from it. But there was negligible spread of this kind when the atmosphere was still.

As a conclusion to this series of studies on factors influencing the distribution of insecticide sprayed from aircraft over woodland, 3 experiments were conducted in which the aircraft sprayed in 3 to 12 parallel runs 75 yards apart. The best kill was obtained from a set of 3 swathes. In samples taken for 75 yards downwind from the third flight-line, the mean mortality was 84 per cent. The summative effect of drift downwind of aerosol from successive flight-lines is considered to be the principal factor in raising mortality to a generally high level. Irregularities in dispersal and dosage at the fringe of swathes are compensated by drift. The success of drift effect depends on wind direction remaining reasonably constant across the flight-line, but this is characteristically variable in the conditions of low atmospheric turbulence desirable for ensuring adequate sedimentation of insecticide on to woodland. In 2 of these 3 experiments on the value of spraying flights in parallel runs, wind direction was fickle and in one case settled almost along the lines of flight. Drift effect was lost and mortalities in the experimental area varied in the test insects from 21 to 100 per cent. Although these incompatible factors cannot be wholly dissociated, or controlled with certainty, in practical aerial spraying programmes it is concluded that the most important factor in obtaining high kills when spraying over woodland is this reinforcing effect of successive swathes due to insecticide drift in a prevailing cross wind.

An appendix shows the test insect, *M. lusoria*, to be more susceptible (in field trials) to the insecticide than *Glossina palpalis fuscipes*.

D. S. Bertram

LABORATORY PROCEDURES

JASWANT SINGH & MISRA, B. G. **J.S.B. Stain—Simplified Method of Preparation.** *Indian J. Malariology.* 1956, June, v. 10, No. 2, 115-16.

A further modification in the preparation of the JSB stain is described [this *Bulletin*, 1944, v. 41, 822; 1954, v. 51, 1007]. The new method is simpler and the stain need not be filtered or matured before use. Medicinal methylene blue (0.5 gm.) is dissolved in 500 cc. water, and 3 cc. of 1 per cent. sulphuric acid is gradually added, followed by 0.5 gm. of potassium dichromate which forms a purple precipitate. Disodium hydrogen phosphate dihydrate (3.5 gm.) is next added, and when the

precipitate has dissolved the solution is boiled in a flask with a reflex condenser for one hour. The stain is then ready for immediate use. A concentrated stain may be prepared by boiling the stain in a beaker to reduce the volume of fluid to a quarter.

P. C. C. Garnham

JASWANT SINGH. **J.S.B. Stain—a Review.** *Indian J. Malariaiology.* 1956, June, v. 10, No. 2, 117-29, 1 fig. & 2 graphs. [39 refs.]

The author first gives a useful summary of the different methods embodying the Romanowsky effect, *i.e.*, the polychroming of methylene blue, and illustrates this process by a figure showing the degradation of the dye after acid and alkaline oxidation. The JSB stain [see this *Bulletin*, 1944, v. 41, 822] was evolved in 1944 as a rapid method for thick or thin blood films; its preparation with modifications in technique is described again here, including the effect of storage under tropical conditions.

JSB stain is excellent for demonstrating the stippling of erythrocytes infected with certain species of malaria parasites, including *Plasmodium berghei*, *knowlesi* and *falciparum*. It can be used also for staining oöcysts and sporozoites, and of course for all stages of the parasites in the blood. The stain gives excellent results with *Leishmania*, trypanosomes, *Toxoplasma*, *Haemoproteus*, microfilariae, *Hepatozoon*, spirochaetes and various bacilli. Preparations treated with JSB stain compare favourably with those stained by the standard methods, and the former has the great advantages of speed and cheapness.

P. C. C. Garnham

KINNEAR, A. A. **Biochemical Normals for South African Bantu.** *South African J. Lab. & Clin. Med.* 1956, Sept., v. 2, No. 3, 263-6. [30 refs.]

REPORTS AND SURVEYS

YEKUTIEL, P. **Epidemiology of Insect-Borne Diseases in Israel.** *Tavruah.* Jerusalem. 1956, Apr., 5-12.

The author traces the incidence of malaria, sandfly-borne diseases, relapsing fever, plague and typhus from the early days of the British mandate (1920), when extensive measures were taken to prevent the breeding of vector species of *Anopheles* and to treat the patients suffering from malaria. In the early twenties the incidence of new cases of malaria was 2,000-5,000 per 10,000 of the population, and this fell to 10·1 in 1949 and 0·5 in 1955. DDT has been widely used in recent years and the

sandflies have largely disappeared, though a few cases of leishmaniasis still occur in remote areas. Relapsing fever, carried by *Ornithodoros tholozani*, is still a problem; it is still contracted in caves, in spite of warnings to the young people who use them, but the incidence is not high.

Plague was common in small outbreaks near Haifa and Jaffa for many years, reaching a peak in 1944, but the liberal use of DDT has apparently controlled it. Typhus of murine origin still occurs; it was formerly mainly a rural disease but has recently increased in towns. DDT is used in specific dusting campaigns. Louse-borne typhus is not now seen.

West Nile fever has become prominent of late, and is probably transmitted by *Culex molestus*. This mosquito is capable of transmitting *Wuchereria bancrofti*, and this infection was present in recent immigrants from Cochin (India), but the chance of transmission is slight, and is reduced by the judicious use of diethylcarbamazine.

The 3 factors which influenced the epidemiological situation have been the establishment of a national government with a Ministry of Health, the use of residual insecticides, and the discovery or introduction of other insect-borne diseases.

Charles Wilcocks

BOOK REVIEWS

RODENWALDT, Ernst. [Edited by.] **Welt-Seuchen-Atlas.** [World-Atlas of Epidemic Diseases] Part II. 3rd issue. pp. II/13-II/18, II/25-II/30, II/37-II/40, II/51-II/62, II/107-II/116, II/147-II/150, 6 text figs. & 10 folding pp. of coloured maps [1956.] Hamburg 1: Falk-Verlag, Burchardstrasse 8. [In German & English.]

The Editor proceeds with the development of what is now a major contribution to geographical pathology. He adds to the previous issues [this *Bulletin*, 1953, v. 50, 772; 1955, v. 52, 499; 1956, v. 53, 951] a fourth part containing material on scarlet fever by BINGEL, plague in Europe and in Africa by RAETTIG, tularaemia in Central Europe by JUSATZ, louse-borne and tick-borne relapsing fever by MARTINI, Q fever in Europe, North Africa and the Near East by TERHAAG, amoebic dysentery and *Entamoeba histolytica* by WESTPHAL, and human ascariasis by SCHLIEPER. The presentation follows the previous pattern: a substantial written statement discussing sources and information on distribution, with in some cases an analysis of epidemiology and illustrated by a series of excellent maps. The text is in German with an English translation except that, unfortunately for the reviewer, the two detailed accounts of relapsing fever by Martini are presented in English in relatively short abstracts only.

The Editor grows happier in his ambitious project and the reviewer, who has offered constructive criticism on previous issues, has here nothing but appreciative comment to make. The subject-matter of the series is more homogeneous than in past issues. In each of the presentations the approach is successful, the main coloured map gives a clear impression of the subject it is to illustrate and this impression can be readily refined by further examination of detail and by reference to the text, which in every case includes a comprehensive bibliography so that original sources can be traced with ease and the reader can be led from first impressions to detailed study with remarkable facility. The difficulties in presentation due to the desire to present too many factors, and especially distribution in both space and time, have been overcome and none of the maps in the present issue are anything but clear. Those on louse-borne and tick-borne relapsing fever are outstanding examples of this type of presentation. The associated text is also attaining a uniformity of presentation and quality. In consequence this series must be acknowledged as achieving the Editor's aims to present geographical pathology largely in visual form but with the character of minute accuracy which was established for such works by HIRSCH.

G. Macdonald

RODENWALDT, Ernst. [Edited by.] **Welt-Seuchen-Atlas.** [World Atlas of Epidemic Diseases] Part II. 4th issue. pp. II/31-II/36, II/41-II/46, II/63-II/66, II/73-II/78, II/117-II/122, II/151-II/156, II/169-II/170, 4 text figs. & 10 folding pp. of coloured maps. 1956. Hamburg 1: Falk-Verlag, Burchardstrasse 8. [In German & English.]

The previous series [this *Bulletin*, 1955, v. 52, 499; 1956, v. 53, 951, and above] is continued to complete Volume II with sections on Plague in Africa from 1899-1952 by RAETTIG, FELTEN and LANGER, Leprosy in Africa 1945-1954 by LITTANN, Poliomyelitis in Africa 1919-1954 by DONLE, Smallpox in Africa 1920-1953 by HENNEBERG, Malaria in Central Europe 1900-1950 by DE JONG and STEINIGER, and Climate of Africa by KNOCH. The map illustrating plague in Africa shows how fully informative this type of presentation can be. It gives at a glance a sound general presentation of distribution which with reasonable study can be elaborated to an appreciation of the nature of the rodent hosts and flea vectors in all parts of the continent; the sources from which this information has been derived can be readily traced in the bibliography, and it is in fact a full justification of the editor's aims.

The other maps and sections maintain the standard of clarity of exposition which has now been achieved after original experimentation. Those entitled Malaria in Central Europe in fact deal with the disease in the Netherlands and Western Germany only, though for these countries they present a very detailed exposition. The section on climate includes

detailed polychrome maps giving January and July isotherms at 2°C. intervals; rainfall is shown as mean annual precipitation amplified by two maps illustrating the months of rain and drought, while the final map displays the distribution of "thermic sultriness" based on the relationship of temperature to the absolute humidity. The climatic maps are of particular value as they probably give a more precise representation of the climate than is available elsewhere, and they should be of material help in the studies of the ecology of disease.

G. Macdonald

TREDRE, R. F. **Notes on Preservation of Personal Health in Warm Climates.** 2nd Edition. 62 pp., numerous figs. 1956. London: Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1.

The value of the *Notes* is revealed by the fact that since the first edition was reviewed in this *Bulletin* [1951, v. 48, 940], there have been two revised reprints and this second edition which expands the information contained in the earlier versions and brings it up to date.

The scope of the *Notes* is indicated by the contents—risks to health of Europeans in the tropics; personal hygiene; insects of medical importance; diseases common in warm countries; modern insecticides; public prevention of malaria; and the results of malaria control. There is a good index as well as an all-too-brief note on the Ross Institute and its publications.

The advice given is informal but informed, and although the second edition is 10 pages longer than the first, it is still hardly thicker than a passport.

John Rathbun